UW-Sat. Reports
A.H. - A.P. Guides

# GENERAL PROGRAMS

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SUBROUTINE : SPLT36

LANGUAGE : Compass

COMPUTER : 3600

PROGRAMMER : Dennis Phillips

PURPOSE : SPLT36 unpacks 36 bit strings and stores them right justified in 48 bit words.

USAGE : CALL SPLT36(NUMBER, PACK, UNPACK)

```
   Where NUMBER  =  Number of words to unpack.
         PACK    =  Starting address of packed block.
         UNPACK  =  Starting address of unpacked block.
```

SUBROUTINE : FLT36

LANGUAGE : Compass

COMPUTER : 3600

PROGRAMMER : Dennis Phillips

PURPOSE : FLT36 converts and restores 36 bit floating point numbers to 48 bit floating point numbers if the 36 bit numbers are in unpacked form.

USAGE : CALL FLT36(UNPACK, NUMBER)

Where UNPACK = Starting address of array containing right justified 36 bit floating point numbers.

NUMBER = Number of words to convert.

SUBROUTINE : UNLOAD

LANGUAGE : Compass

COMPUTER : 3600

PROGRAMMER : Eric A. Smith

DATE : March 15, 1967

PURPOSE : Unloads a tape

USAGE : CALL UNLOAD will unload last selected tape

PROGRAM : RECCHECK

LANGUAGE : F-63

COMPUTER : 3600

PROGRAMMER : Eric A. Smith

DATE : February 5, 1968

PURPOSE : This program reads a requested number of records on a tape, and prints out record length and parity information for each record.

USAGE : The program requires a single control card.

Col. 1: Tape parity (0 = BCD; 1 = Binary).

Col. 2-5: Number of records to be read; if this parameter is left blank all records of all files will be read; if a number is specified, the program will stop if it reaches an EOF before all the desired records are read.

Assign tape to be read to LUN 1.

PROGRAM : COPVER

LANGUAGE : F-63

COMPUTER : 3600

PROGRAMMER : Eric Smith

DATE : December 28, 1966

PURPOSE : Copies of up to ten tapes under one run with verification and parity capabilities. Will also copy onto two tapes from one tape as specified on a control card.

USAGE : Tapes to be copied should be given logical unit numbers ordered sequentially from 1 (1, 2, 3 -----).

Copy tapes should be given logical unit numbers ordered sequentially from 26 (26, 27, 28 --------).

If there are to be two copy tapes for a single input tape, the second tape should be given a logical unit number 10 plus the logical unit number of its corresponding first copy tape (36, 37, 38 -----).

Control Cards: A master control card must come first. It specifies the number of tapes to be copied and the maximum number of parity errors withstood on any one file.

Master Control Card Format:

Col. 1,2 : Number of tapes to be copied (not to exceed 10).
Col. 3,4 : Maximum number of parity errors withstood on a single file.

Tape Control Cards: For each tape to be copied there are two control cards following the master card. The first of these specified the following:

Col. 1 : 0 if tape is BCD, 1 if Binary.
Col. 2 : Number of files to be copied.
Col. 3 : 0 if no record by record printing on copy, 1 if printing is desired.
Col. 4 : 0 if suppress verify, 1 if verify desired.
Col. 5 : 0 if no record by record printing on verify, 1 if printing desired.
Col. 6 : 0 if no parity checking is wanted, 1 if parity checking is desired on both copy and verify (if used).

The second card designates information needed if a second output tape for a single input is used. If this facility is not used, a blank card should be inserted. If a second tape is used, the following information is needed:

Col. 1 : File number during which the tape switch occurs.
Col. 2-6 : Number of records to be transferred to first tape. All following records will be transferred to second tape. (Relative to file in which switch occurred).

PROGRAM : OCTDUMP

LANGUAGE : F-63

COMPUTER : 3600/1604

PROGRAMMER : Eric Smith

DATE : January 8, 1967

PURPOSE : Straight octal dump of a specified magnetic tape with indication of parity errors.

USAGE : Assign tape to be dumped to logical unit number 1.

Specify on a control card the parity of the tape (BCD or Binary) and the number of files to be dumped.

```
Col.   1  :  Parity of tape (BCD = 0, Binary = 1).
Col. 2-3  :  Number of files to be dumped.
```

PROGRAM : BCDPUNCH

LANGUAGE : F-63

COMPUTER : 1604/3600

PROGRAMMER : Eric A. Smith

DATE : February 9, 1968

PURPOSE : This program punches selected cards off of a magnetic tape containing BCD card images.

USAGE : Tape should be assigned to LUN 1.

Control Cards

A pair of cards, the first containing the first BCD record to be punched, the second containing the last BCD record to be punched, of a series of records, is positioned after the program deck. The program searches down the tape until it locates the initial record and punches that record and all records up to and including the indicated final record. A second pair of cards may also be used for another series of records to be punched but this second series must be after the first series on the tape.

This procedure may be carried out indefinitely, however, to indicate that the run is complete, a card with 80 astericks must be the last card of the deck.

PROGRAM : SUMS

LANGUAGE : F-63

COMPUTER : 1604/3600

PROGRAMMER : Eric A. Smith

DATE : February 9, 1968

PURPOSE : This program reads an observation of a set of items from data cards, and creates a new set of items, formed by user specified sums of the original items.

USAGE : The following cards are required

1. Control Card 1

   Col. 1-3: Number of original items (cannot exceed 100).
   Col. 4-6: Total number of items used in summation process (include repetitions in this count; cannot exceed 999).
   Col. 7-9: Number of new items (cannot exceed 100).

2. Control Card(s) 2

   On a card or a set of cards in a 26I3 format, list the complete sequence of item numbers that are used in the summation process.

3. Control Card(s) 3

   On a card or set of cards in a 26I3 format, list the indices of the sequence read on Control Card(s) 2, such that they indicate the first of a group of old items to be used in forming the next new item.

4. Control Card 4

   Input format (start in Col. 1) of the original items. The program considers the first 6 columns of an observation to be identification so that this format _must_ always begin with an A6 as the first field.

5. Control Card 5

   Output format (start in Col. 1) of the new items. The program considers the first 6 columns of an observation to be an identification field corresponding to the input identification so that this format _must_ always begin with an A6 as the first field.

6. Data Cards

Any number of observations may be included in the data but the last data card or set (thisshould be a dummy card or set since no output is created for it) must contain astericks in the 6 column identification field.

Steps 1 through 6 may be repeated any number of times, however, to indicate that the run is complete, a card with a negative number in the first 3 columns must be included.

EXAMPLE : There are 3 original items from which 2 new items are to be formed

New Item 1 = Old Item 2 + Old Item 3
New Item 2 = Old Item 1 + Old Item 2

First Card : ^^3^^4^^2

Second Card : ^^2^^3^^1^^2

Third Card : ^^1^^3

Fourth Card : (A6,3I5)

Fifth Card : (A6,2x,I6,IX,I6)

********

Data Cards

********

Last Card : ^-1

PROGRAM : RECODE

LANGUAGE : F-63

COMPUTER : 1604/3600

PROGRAMMER : Eric Smith

DATE : December 10, 1967

PURPOSE : Single Column Recoding

METHOD : Deck Structure

A. First Card

80 column alphanumeric title card which is punched out preceeding recoded deck.

B. Second Card

Col 1-2: Number of allowable characters in data deck (NC)*.
Col 3-66: Allowable character set.

C. Third Card

For each column that is not to be recoded, a 1 punch is required in the corresponding column of this card. This feature allows for column duplication. Leave all other columns blank.

D. Recode Cards

For each allowable character a card is required designating the recode scheme for the 80 columns; for columns that are intended to be duplicated (Third Card) the corresponding columns of this card are left blank; there should be NC Recode Cards and they should be ordered accoring to the order of the allowable character set.

E. Data Deck

F. END or FINISH Card

1. A card with the word END in the first three columns denotes the completion of a problem and the initialization of the next problem, thereby requiring steps A-E to be repeated.
2. A card with the word FINISH in the first six columns denotes the completion of the run; this should be the last card of the deck.

*NOTE: (a) Characters in the data not included in the allowable character set will be duplicated.

PROGRAM : CORMAT

LANGUAGE : FORTRAN

COMPUTER : 3600

PROGRAMMER : Eric Smith

DATE : December 29, 1967

PURPOSE : Computes means, standard deviations, and the correlation matrix of a set of variables.

METHOD : The program requires 3 control cards per run; an identification card, a parameter card, and a variable format card.

1. Identification Card

   This is an 80 column alphanumeric title card.

2. Parameter Card

   Col 1-3: No. of variables ($2 \leq NV \leq 175$).
   Col 4-8: No. of observations ($1 \leq NO \leq 99999$).

3. Variable Format Card

   This card describes the format of the data. The card starts with a left hand parenthesis in column 1 and continues across the card.

4. Data

   There should be a data card or data card set for each observation. The program does not handle missing data problems.

5. Repeat steps 1-4 for next problem.

6. End the final problem with a FINISH card. This card contains the word FINISH in the first 6 columns.

## A. IDENTIFICATION

TITLE : ANOVA

LANGUAGE : FORTRAN 63

COMPUTER : 1604/3600

PROGRAMMER : Robert I. Jennrich (Revised by Eric Smith)

DATE : December 29, 1967

## B. PURPOSE

The purpose of this routine is to compute the sums of squares mean squares, and degrees of freedom which appear in an analysis of variance table. In addition, certain means may be obtained. Generally speaking, the routine will perform the calculations required for any balanced fully replicated or nested design. Fractionally replicated designs such as latin squares, unbalanced designs such as missing data problems, and proportional subclass problems cannot be handled. The routine computes only those entries of an analysis of variance table which are called for. If desired, the analysis may be repeated on a number of dependent variables.

The routine will handle designs with up to 9 factors and any number of dependent variables. An exact description of the total amount of data which can be handled is given later; but, in general, any design can be handled which contains less than 15,000 degrees of freedom outside of the error term.

## C. CARD PREPARATION

1. First Control Card

Title of the problem (80 column alphanumeric title)

2. Second Control Card

Col.4 : Number of indices, p.
Col.5-8 : Number of dependent variables.
Col.9-12: Number of control words,
Col.13-16:Number of levels of first index.
Col.17-20:Number of levels of second index.
Col.21-24:Number of levels of third index,
Etc.

After the number of levels of each of the p indices is punched in successive four-column fields the remainder of the fields may be left blank.

3. Control Word Cards

| | | |
|---|---|---|
| Col. 1-9 | : | First code word $C_1$ and zeros in the unused columns. |
| Col. 10 | : | 1 if the means $A(C_1)$ are desired, 0 otherwise. |
| Col. 11-19 | : | Second code word $C_2$. |
| Col. 20 | : | 1 if the means $A(C_2)$ are desired, 0 otherwise. |

Etc.

If more than one card is required, one should continue on additional cards. The unused columns of the last card, if any, may be left blank. Since careless use of 1 following a code word may cause the printing of great quantities of unwanted results, use 0 of in doubt.

4. Format Card

| | | |
|---|---|---|
| Col. 7-8 | : | Number of elements of data per set (must be greater than 2), |
| Col. 9-80 | : | Fortran format statement. |

The data is read in sets of one or more data cards. These sets may contain up to 99 elements of data. The format of the data in each set is described by a Fortran format statement. The word "FORMAT" is dropped from the format statement, and the statement begins with its first parenthesis in column 9 and ends with its last parenthesis anywhere on the card. Only E, F, and X formats may be used. The data need not "come out even"; usused fields in the last set will be ignored, but the cards must be present.

5. Data Cards

The data cards must be punched in sets in accordance with the format chosen on card (3). The dependent variables must be ordered lexicographically on their indices. For example, if the values of a dependent variable are denoted by $x_{ij}$ ; i = 1,2 ;j= 1,2,3, the data must be ordered:

$$x_{11}x_{12}x_{13}x_{21}x_{22}x_{23}$$

with the rightmost index moving fastest. If there is more than one dependent variable, the first values of all the dependent variables are followed by second values of all the dependent variables in the same order, etc. For example, if $x_{ij}$ and $y_{ij}$ denote the values of two dependent variables, they must be ordered:

$$x_{11}y_{11}x_{12}y_{12}x_{13}y_{13}x_{21}y_{21}x_{22}y_{22}x_{23}y_{23}$$

Example: Consider a two factor complete factorial design with cell replications and one dependent variable. Let $x_{ijk}$ = value of the $k^{th}$ replicate of the $i^{th}$ level of factor one, and the $j^{th}$ level of factor two, where

$i = 1,\ldots,15$ , $j = 1,\ldots,25$ ; $k = 1,\ldots,10$ . Assume that for each i and j the data values $x_{ij1},\ldots,x_{ij10}$ are integers and are punched in successive 3-column fields in a card beginning in column 21. The control cards would look as follows:

```
a.  _ _ _3_ _ _1_ _ _5_ _15_ _25_ _10_ _ _ _ _ _ _ _ _ _ _ _ _ _NAME

b.  00000000011000000001010000000111000000001110000000

c.  _ _ _ _ _ _ _10(20X,10F3.0)
```

d. Data cards punched as described above and ordered lexicographically on i and j.

The means called for by the first three code words will be printed first. They will be

$x_{...}$

$x_{1..}, x_{2..}, \ldots, x_{15..}$

$x_{.1.}, x_{.2.}, \ldots, x_{.25.}$

The means will be followed by the analysis of variance table:

| CONTROL WORD | REDUCED SUM OF SQUARES | DEGREES OF FREEDOM | MEAN SQUARE |
|---|---|---|---|
| 0000000001 | $\sum x_{...}^2$ | 1 | RSS/1 |
| 1000000001 | $\sum(x_{i..}-x_{...})^2$ | 14 | RSS/14 |
| 0100000001 | $\sum(x_{.j.}-x_{...})^2$ | 24 | RSS/24 |
| 1100000000 | $\sum(x_{ij.}-x_{i..}-x_{.j.}+x_{...})^2$ | 336 | RSS/336 |
| 1110000000 | $\sum(x_{ijk}-x_{ij.})^2$ | 3375 | RSS/3375 |

All of the summations are over i, j, and k.

6. Finish Card

If a new problem is desired, repeat steps 1-5, otherwise a card with the word FINISH in the first 6 columns is required.

D. TIME ESTIMATION

The 1604 time required for calculation can be estimated by the formula

$$T = (.0025) \cdot M \cdot N$$

where T = time in seconds.
M = no. on control words.
N = total number of elements of data.

In making 1604 time requests it is advisable to request at least 25% more time than the estimate given by the formula in order to prevent a time limit intercept before the completion of the calculations.

E. NOTATION

| | | |
|---|---|---|
| C | : | Code word |
| S(C) | : | Sum of squares for code word C |
| A(C) | : | Sequence of means for C |
| n(C) | : | Number of levels averaged over to obtain A(C) |
| R(C) | : | Reduced sum of squares for C |
| df(C) | : | Number of degrees of freedom of R(C) |
| M(C) | : | Mean square for (C) |

F. COMPUTATION

The input data has the form $x_{i_1, i_2, \ldots, i_p}$, where $p \leq 9$.

A code word has the form $a_1 a_2 \ldots a_p$. If $k \leq p$, the number $a_k$ = 0 or 1 and is called the code of the $k^{th}$ index.

Let C be a code word, and let the data be represented by $x_{ij}$, where i represent the set of code 0 indices and j represents the set of code 1 indices for this control word. Then, for each code word, C, in an ordered list of code words, the following calculations are performed:

1. n(C) = no. of levels of i (product of levels of all code zero indices)

2. m(C) = no. of levels of j (product of levels of all code one indices)

3. $A(C) = \frac{1}{n(C)} \sum_i x_{ij} = x_{\cdot j}$

4. $S(C) = \sum_{ij} x^2_{\cdot j}$

We say that $B < C$ if the code word B precedes C in the list of code words, and if the code 1 indices of B are a proper subset of the code 1 indices of C.

5. $R(C) = S(C) - \sum_{B<C} R(B)$

6. $df(C) = m(C) - \sum_{B<C} df(B)$

7. $M(C) = R(C)/df(C)$

Without further control, all of the results [1-7] are printed out except (2) which can be called for. Note that the results depend not only on the code words but also on their order.

If there is more than one dependent variable, the whole calculation is repeated for each one.

G. SIZE RESTRICTION

Let $C = a_1 a_2 \ldots a_p$ be a code word. For each $k - 1, \ldots, p$ let $b_k = a_k$ if the code $a_k$ is preceded by a 0 code in the code word C, or if the code word **C** is followed by a 1 on the control card (i.e., means are being called for). Otherwise, let $b_k = 0$. Let

$$N(C) = N_1^{b_1} \,.\, N_2^{b_2} \,.\,.\,.\, N_p^{b_p} + 1$$

where $N_i$ is the number of levels of the $i^{th}$ index. Let M be the number of dependent variables. Then the amount of data must satisfy the restriction

$$M \,.\, \sum_C N(C) \leq 16,384$$

where the summation is taken over the list of code words. If this restriction is violated, the only result will be an error stop indicating the violation.

PROGRAM : PFIT

LANGUAGE : F-63

COMPUTER : 3600/1604

PROGRAMMER : Eric Smith

DATE : January 9, 1967

PURPOSE : Computes a least square fit of desired order of a given set of points. X values used should be scaled between (-1, + 1). It is a good idea to scale Y values small also.

USAGE : Parameters are as follows:

```
SUBROUTINE (X,Y,N,COOR,XMAT,K,KI,IRANK,DETER)
```

X = Array of X values (independent variable).  
Y = Array of Y values (dependent variable).  
N = Number of data points and dimensions of X and Y arrays.

COOR = Coefficients array.  
XMAT = Inverse of matrix for solution.  
K = Desired degree of fit.  
KI = K + 1 = Dimension of COOR and XMAT arrays.  
IRANK = Order minus rank of XMAT.  
DETER = Determinent of XMAT.

Note: Do not forget to rescale the X and Y values upon return.

PROGRAM : MATMPY

LANGUAGE : F-63

COMPUTER : 3600/1604

PROGRAMMER : Eric Smith

DATE : January 9, 1967

PURPOSE : Routine for matrix multiplication

USAGE : Parameters to the subroutine are as follows:

```
CALL MATMPY (A, B, C, L, M, N)
```

A = First matrix.
B = Second matrix.
C = Product matrix.
L = Number of colums of first matrix and number of rows of second matrix.
M = Number of rows of first matrix.
N = Number of colums of second matrix.

SUBROUTINE : SMOOTH

LANGUAGE : F-63

COMPUTER : 3600

PROGRAMMER : Dennis Phillips

DATE : August 17, 1967

PURPOSE : The basic purpose of this program is to smooth the contours found by program CONTOUR. The program is written in subroutine form. It accepts a series of points which are to be plotted and adds points that smooth the output between the original points. The smoothing insures the continuity of the first order derivative besides the continuity of the curve. If effect, the program is weighing more points at one time to produce a contour.

USAGE : The program has three entry points. The calling sequence of the main entry of the program is CALL SMOOTH (X,Y,NPOINTS,IDEM,IOPENCLO, IFIN). X and Y correspond to the arrays that hold respectively the x and y values of the points that one desires to plot. NPOINTS indicates the number of points that the user is calling SMOOTH with, and it is changed to the number of points generated and stored from the beginning of the x and y arrays that are ready for plotting. IDEM is the dimensioned size of the X and Y arrays and indicates to the program how much space is available for storing generated points. IOPENCLO specifies whether the user wishes the curve to close on itself or not. The curve will close on itself if IOPENCLO=2, otherwise the curve will remain open ended if IOPENCLO=1. IFIN tells the calling program whether or not SMOOTH was able to fit the generated points into the alloted area. If IFIN=1, the storage space was too small and another call of the form CALL NOTFIN(X,Y,NPOINTS,IDEM,IOPENCLO,IFIN) is required. This allows SMOOTH to finish its job. If it is not done the second time, it is necessary to call NOTFIN again, etc. The third entry point allows the user to control the number of points generated by SMOOTH. The name of the entry point is STMINDIS. This entry point allows the user to set a distance such that if any two consecutive points of his input are closer to each other than this distance no points are added in between. The calling sequence is CALL STMINDIS(SMALLDIS).

SUBROUTINE : LAPLACE

LANGUAGE : F-63

COMPUTER : 1604/3600

PROGRAMMER : Eric A. Smith

DATE : February 1, 1968

PURPOSE : Computes the laplacian array from a given psi array and then computes the sum, mean, and standard deviation of the laplacian.

METHOD : The calling sequence for LAPLACE is as follows

```
CALL LAPLACE(XPSI,XLAP,DELX,DELY,CONSTANT,M,N,SUM,XMEAN,SD)
```

XPSI = Input array (psi valves).

XLAP = Laplacian (This array is the same dimension as XPSI and must be declared in the calling program).

DELX = $\Delta$X array (This array has the row dimension of XPSI).

DELY = $\Delta$Y array (This array has the column dimension of XPSI).

CONSTANT = Constant factor to be multiplied times laplacian.

M = Column dimension of XPSI and XLAP and linear dimension of DELY.

N = Row dimension of XPSI and XLAP and linear dimension of DELX.

SUM = Sum of laplacian.

XMEAN = Mean of laplacian.

SD = Standard deviation of laplacian.

PROGRAM : BOUNDRY

LANGUAGE : F-63

COMPUTER : 3600/1604

PROGRAMMER : Eric Smith

DATE : January 9, 1967

PURPOSE : Plots world maps of any of four projections and scaled to the dimensions requested. It will plot an equispaced, mercator, south polar, or north polar projection.

USAGE : The program will plot a series of maps each of which requires a control card containing 3 parameters. A blank card terminates the program.

Control Card Format:

Col. 1-2: 1 if a Equispaced projection is desired.
2 if a Mercator projection is desired.
3 if a North Polar projection is desired.
4 if a South Polar projection is desired.

Col. 3-4: Height of map (indicates diamter if polar projection is specified).

Col. 5-6: Length of map for equispaced or mercator projections. If Polar Projection is specified, this indicates the degrees of latitude beyond the equator that the projection will cover.

Tape "Roy 1" mst be assigned to logical unit number 1 and submitted with the program as it contains the continental boundry coordinates given in latitude and longitude.

PROGRAM : SPECTRA

LANGUAGE : F-63

COMPUTER : 3600/1604

PROGRAMMER : Joe Wertz

DATE : February 16, 1967

PURPOSE : Power spectrum analysis

USAGE : CALL SPECTRA (N,M,ITRND,DT,NEWR,IPRNT,NORM,INDPLT,IFINE,
NWINDOW,IDENT)

N = Number of data points.
M = Number of lags for which R is computed.
ITRND = 0 for no trend removal.
1 for linear trend removal.
DT = Spacing of points.
NEWR = 0 for using the current autocorrelation function.
1 for computation of the autocorrelation function.
IPRNT = 0 for no print (except basic statistics).
1 for printing.
NORM = 0 for unnormalized PSD (graph label correct).
= 1 for normalized PSD (one-sided).
= 2 for normalized PSD (two-sided).
INDPLT = 0 for no plotter output.
= 1 for new graph.
= 2 for overlay (must have a graph to overlay).
IFINE = Number of points where spectrum is computed.
NWINDOW = Window used (5HTUKEY,7HHANNING,6HPARZEN,8HBARTLETT).
IDENT = 48 hollerrith characters for identification.

Restrictions

$0 \angle N \angle 8000$
$M < N$
$M \angle 800$
$IFINE \leq 799$

There must be a common block in the main program set up exactly as in the subroutine;

```
COMMON /SPECTRA/DATA(8000),SMOOTHED(800),
AUTOCORR(800),WEIGHT(800),FFREQ(800),Q(1000)
```

PROGRAM : STEST

LANGUAGE : F-63

COMPUTER : 3600

PROGRAMMER : Eric A. Smith

DATE : February 1, 1967

PURPOSE : This program generates a sin wave and runs it through subroutine SPECTRA for testing purposes.

USAGE : The program is run without the use of control cards. Plotter output is created.

SUBROUTINE : MPLT

LANGUAGE : F-63

COMPUTER : 1604 - 3600

PROGRAMMER : Tom Nash (D. J. Dileonardo, Bettis Atomic Power Laboratory,
Pittsburgh, Pa.)

DATE : March 25, 1966

PURPOSE : This subroutine plots gridded Z values as an isometric surface. The grid is rotated and tipped toward the viewer to give maximum depth perception.

USAGE : CALL MPLT (Z, I1, I2, CREF, STP, IT, IB, ILT, IRT, IPALL, CTITLE)

Z : Double-subscripted array where the gridded Z-values are stored.

I1 : Row dimension of Z.

I2 : Column dimension of Z.

CREF : Minimum value to be used in sizing Z-values. Normally CREF = 0.0.

STP : If STP = 0.0, the routine will use the maximum Z-value to set the scale. If STP > 0.0, STP will be used to set the scale.

IT : Minimum row to be plotted.

IB : Maximum row to be plotted.

ILT : Minimum column to be plotted.

IRT : Maximum column to be plotted.

IPALL : 1 if hidden lines are to be plotted.
2 if hidden lines are not to be plotted.

CTITLE : This the FWA of a 3 word BCD identification array.

SUBROUTINE : FETUR

LANGUAGE : F-63

COMPUTER : 3600

PROGRAMMER : Eric A. Smith

DATE : August 31, 1967

PURPOSE : This program analyses selected regions of any numeric series. A region for our purposes is defines as an intervel of the series where the slope of a linear least squares fit through the region is less than the "critical slope". The "critical slope" is a function of 4 variables. The user has control over the "critical slope" as these variables are subroutine parameters. The program divides the series into regions satisfying the specified conditions and these regions have their menas, variances, and standard deviations computed. By the use of another parameter, regions falling below a minimum region size are ignored. A last parameter determines a uniform section size that the regions are further broken down into. When this occurs, the individual sections have their statistics computed. The information is output as a table consisting of 3 different measures; those areas of the series not within the regions are referred to as boundaries; rejected regions are referred to as holes; regions or sections of regions are referred to as clouds. As the series is scanned from left to right, this information is progressivly recorded along with a count for each measure. The accepted regions are numbered and within each region the individual sections are numbered.

USAGE : The calling sequence is as follows:

```
CALL FETUR(GRID,IDIM12,ITITLES,NSA,NSS,LDB,NBD,LAS,MSS)
```

GRID = Linear array containing numeric series.

IDIM12= Number of points in series.

ITITLES= 10 word alphanumeric title.

NSA = Number of samples averaged.

NSS = Number of samples skipped.

LDB = Boundry determinator difference.

NBD = Consecutive differences needed.

LAS = Minimum sample section.

MSS = Maximum sample section.

SUBROUTINE : SHUFFLE

LANGUAGE : Compass

COMPUTER : 3600

PROGRAMMER : Paul Sampson

DATE : May, 1962

PURPOSE : To produce a random permutation of the integers 1,2,...,n and store this sequence into a TYPE INTEGER array beginning with a specified element of the array. Optionally, the user may obtain a random reordering of a TYPE REAL or TYPE INTEGER array, by specifying the starting element and a number of elements to be reordered.

USAGE : The following calling sequence is used:

```
CALL SHUFFLE (A(i,j,k),NN,KK)
```

A(i,j,k) = The starting element of those elements to be randomly reordered in array A.

NN = An integer which specifies the number of elements to be shuffled in the array A.

KK = An integer constant equal to either 1 or 0, and used as follows:

a. If A is a TYPE REAL or TYPE INTEGER array and KK=0, then the subroutine will randomly reorder the NN consecutive elements of A, starting at element A(i,j,k).

b. If A is a TYPE INTEGER array, and KK=1, then the subroutine will produce as elements of A, a random permutation of the integers 1,2,...,NN starting at element A(i,j,k), and continuing through NN consecutive memory locations.

SUBROUTINE : RANSS

LANGUAGE : Compass

COMPUTER : 3600

PROGRAMMER : William Silverman - Richard Wolfe

DATE : February, 1963

PURPOSE : To generate random floating point numbers distributed according to the Normal (Gauss) distribution with a mean of 0 and a variance of 1. The range of the generated distribution is between plus and minus 8.

USAGE : An odd integer between 0 and $2^{43}$ is assigned by the user prior to the first call to RANSS, and this number determines the sequence of deviates that will be generated. This odd integer is changed by the subroutine to prepare for the next call and generation. The following calling sequence is used:

```
CALL RANSS (KK,RR)
```

KK = The odd integer assigned as above.

RR = The generated deviate.

FUNCTION : RANF

LANGUAGE : Compass

COMPUTER : 3600

PROGRAMMER : Nancy Clark - John Davies

DATE : January, 1966

PURPOSE : To generate a sequence of pseudo-random numbers, uniformly distributed over the range of 0 to 1 when TYPE REAL is used. If TYPE INTEGER is used, the range is from 0 to 1 (if interpreted as a fraction) or from 1 to $2^{47}$-1 (if interpreted as an integer).

Alternate entry points are provided to allow the user to extract and replace the current generative number.

USAGE : The alternate entry points use the following calling sequence:

CALL RANFGET (R1), where R1 is returned as current generative number.

CALL RANFSET (R2), where R2 sets the current generative number.

The use of the function is as follows:

RANF (-1), where the use of -1 requests a floating-point response.

RANF (+1), where the use of +1 requests an integer response.

CAUTION : When requesting a TYPE INTEGER response, the TYPE REAL replacement variable X where X = RANF (+1), should be equivalenced to a TYPE INTEGER variable IX such that IX can be used as an integer.

SUBROUTINE : IRAN

LANGUAGE : Compass

COMPUTER : 3600

PROGRAMMER : Paul Sampson - Eric Smith

DATE : May 9, 1962

PURPOSE : This subroutine produces a random integer n where $1 \leq n \leq m$, m being a parameter to the subroutine.

USAGE : The following calling sequence is used.

```
CALL IRAN (mm, nn)
```

mm = Upper limit to random integer (specified in calling program).

nn = Random integer (generated by IRAN).

SUBROUTINE : BESTFIT

LANGUAGE :

COMPUTER :

PROGRAMMER : John Benson

DATE :

PURPOSE : This subroutine fits least square polynomials to a set of points until it arrives at the best fit (within the limitations specified by calling parameters).

USAGE : This program is presently under development.

SUBROUTINE : POST

LANGUAGE : 3600 Fortran/Compass

COMPUTER : 3600

PROGRAMMER : Eric A. Smith

DATE : February 15, 1968

PURPOSE : This is a general numeric gridding display program with options for both integer and floating point cases.

USAGE : The program requires that the User write his own input subroutine. The program directs calls to this routine with a CALL INPUT (IDIM1, IDIM2,GRID) statement, were IDIM1 = the number of columns and IDIM2 = the number of rows (read from a control card prior to the call as will be explained) of the input area GRID (GRID may be an integer or floating point array depending on which case is used; see below). Since GRID is a linear array, the subroutine must make provisions for storing the elements in a linear format, i. e., rowwise. After the input routine is prepared, the subroutine deck should be placed in the program deck, following 3600 program order rules. If this subroutine requires the reading of cards, note that they must be positioned so as not to interfere with the main program control cards (see below).

The program is set up to process groups of input grids under one set of parameters with the provision of reinitiating the parameters for a second group and so on. The following information is required on control cards:

Main Parameter Card

Col. 1-3: Number of columns of current group of input grids.

Col. 4-6: Number of rows of current group of input grids.

Limitation: NC x NR cannot exceed 32,000.

Col. 7: I for integer case.

F for floating point case.

Col. 8-9: For integer or floating point cases, this number specifies the format field length of the values to be posted. This value must be specified and be equal to or greater than 1.

Col. 10-11: For the floating point case, this number specifies the format field length to the right of the decimal point of the values to be posted. This number must be at least one less than the total field length. For the integer case, leave this parameter blank.

Col. 12-13: For integer or floating point cases, this number specifies the number of spaces to be left between values across a line. If no spaces are desired, leave this parameter blank.

Col. 14: 0 or blank specifies that line repetition is not used.

1 specifies that line repetition is used.

Col. 15-16: Specifies how many spacings will be between print lines; if Col. 14 is 0 or blank, blank spacing is used; if Col. 14 is 1, the line is repeated; leave blank if no extra spacing is desired.

Col. 17-18: Number of extra copies of maps desired; leave blank if no extra copies are desired.

Col. 19-20: Specifies logical tape unit onto which maps are printed ($1 \leq \text{LUN} \leq 49$; if left blank or out of range LUN is assigned to 61, i.e., the standard output unit).

## Title Cards and Subroutine INPUT Cards

After these parameters are read, a group of input grids may be processed. Each grid is input on a separate call to the User subroutine INPUT. Immediatly before the main program calls INPUT, it must read an 80 column alphanumeric Title Card, which is used as a heading for that particular numeric display. Any Parameter Cards, Title Cards, or Data Cards that subroutine INPUT requires must be positioned after this Title Card. This card order is followed for a complete group of input grids. After a group of grids have been processed, the User has the option to process another group of input grids or to finish the run. If a next group is desired, a card with the word END in Cols. 1-3 must follow the last group of data input and the process is repeated. If a finish is desired, a card with the word FINISH in Cols. 1-6 must follow the last group of data input.

RESERVED NAMES: The following names may not be used by the User:

Entry Points

1. POST

Common Blocks

1. /1/

LOADING : The following BANK cards should be used with the program:

1. $\substack{11\\0\\7\\9}$BANK,(1),/1/

2. $\substack{11\\0\\7\\9}$BANK,(0),ALL.

The following DEMAND card should be used with the program:

$\substack{7\\9}$DEMAND, 16000

OUTPUT : A numeric display associated with a grid is output in a series of strips with each strip a maximum of 135 columns. Each strip will include all rows of the grid.

## SUMMARY OF CARD ORDER

1. $\substack{7\\9}$JOB,0025,0717/SMITH,10
2. $\substack{7\\9}$PRINTALL
3. $\substack{7\\9}$DEMAND,16000
4. Any TAPE, EQUIP, and REMARK Cards
5. $\substack{7\\9}$FTN,L,X,A,R,P
6. Source Deck of Subroutine INPUT
7. SCOPE Card
8. $\substack{11\\0\\7\\9}$BANK,(1),/1/
9. $\substack{11\\0\\7\\9}$BANK,(0),ALL.
10. $\substack{7\\9}$LOAD
11. RBD of POST
12. $\substack{7\\9}$RUN,10,99999,1
13. Main Parameter Card
14. Title Card of Grid to be read by Subroutine INPUT
15. Any Parameter, Title, or Data Cards read by Subroutine INPUT

    *****

16. Repeat steps 14-15 as often as necessary

    *****

17. END Card if steps 13-16 are to repeated

    FINISH Card if run is over

PROGRAM : CHRDSPLY

LANGUAGE : 3600 Fortran/Compass

COMPUTER : 3600

PROGRAMMER : Eric A. Smith

DATE : June 6, 1967

PURPOSE : This is a general character display program designed to allow the User to specify a printer character to a range of values over elements of a grid and then outputting the grid, in character form, on a line printer. The program allows for overprinting characters.

USAGE : The program requires that the User write his own input subroutine. The program directs calls to this routine with a CALL INPUT (IDIM1, IDIM2,GRID) statement, where IDIM1 = the number of columns and IDIM2 = the number of rows (read from a control card prior to the call as will be explained) of the input area GRID (Grid is a floating point array). Since GRID is a linear array, the subroutine must make provisions for storing the elements in a linear format, i.e., rowwise. After the input routine is prepared, the subroutine deck should be placed in the program deck, following 3600 program order rules. If this subroutine requires the reading of cards, note that they must be positioned so as not to interfere with the main program control cards (see below).

The program is set up to process groups of input grids under one set of parameters with the provision of reinitiating the parameters for a second group and so on. The following information is required on control cards:

Main Parameter Card

Col. 1-3: Number of columns of current group of input grids.

Col. 4-6: Number of rows of current group of input grids.

Limitations: 1. $(((NC-1)/8 + 1) \times NR) \times K$ cannot exceed 4,000, where k = total number of character sets (1 main set + K-1 overprint sets).

2. NC x NR cannot exceed 32,000.

Col. 7-9: The number of intervals to which characters are to be assigned ($2 \leq NI \leq 64$).

Col. 10: 0 or blank specifies that the BCD characters to be used will themselves be read on the Character Set(s) Card(s) in a 64R1 format. They should be punched in order as to their assignment to an ascending set of intervals.

1 specifies that the octal codes (internal) of the BCD characters to be used will be read on the Character Set (s) Card (s) in a 4002 format. This feature enables the User to have access to the complete set of 3600 printer characters, otherwise unavailable on the keypunch. The codes should be punched in order as to their assignment to an ascending set of intervals.

Col. 11: 0 or blank specifies that the size of the intervals over the range of values is uniform, requiring the specification of the following two parameters.

1 specifies that the size of the intervals over the range of values is non-uniform requiring an Interval Bounds Card(s).

Col. 12-21: If Column 11 contains a 0 or blank, this parameter specifies a floating point number which is the upper bound of the first interval (F10.4, if the decimal is not punched).

Col. 22-31: If Column 11 contains a 0 or blank, this parameter specifies a floating point number which is the size of the uniform intervals (F10.4, if the decimal is not punched). Note that the first and the last intervals are not necessarily equivalent to the specified interval size. This is because the interval bounds are computed by a recursive adding of the interval size to the initial upper bound, ending with the computation of the upper bound of the next to the last interval. Since the first interval has no lower bound specified, and the last interval has no upper bound computed, these two intervals are, in a sense, open ended.

Col. 32: 0 or blank specifies that line repetition is not used.

1 specifies that line repetition is used.

Col. 33-34: Specifies how many spacing will be between print lines; if Col. 32 is 0 or blank, blank spacing is used; if Col. 32 is 1, the line is repeated; leave blank if no extra spacing is desired.

Col. 35-36: Number of extra copies of maps desired; leave blank if no extra copies are desired.

Col. 37-38: Specifies logical tape unit onto which maps are printed ($1 \le \text{LUN} \le 49$; if left blank or out of range LUN is assigned to 61, i.e. the standard output unit).

Col. 39: Number of overprint sets desired ($0 \le \text{OCS} \le 9$).

### Character Set (s) Card (s)

This card(s) contains either the BCD characters or the octal codes of the BCD characters to be assigned to the intervals. Parameter 4 of the Main Parameter Card specifies which type is read. Parameter 3 of the Main Parameter Card specifies the total number of characters or codes read. Overprint sets follow the Main Character set on separate cards.

Note: If a single character is desired in a specific position, the overprint characters corresponding to that position must be blank.

### Interval Bounds Card(s) (Optional)

If Parameter 5 of the Main Parameter Card contains a 1 punch, this card (s) contains the NI-1 (may not exceed 63) upper bounds for the NI specified intervals (see explanation of uniform intervals). This card allows non-uniform intervals to be chosen (uses an 8F10.4 format; use extra cards, if necessary).

### Title Cards and Subroutine INPUT Cards

After these parameters are read, a group of input grids may be processed. Each grid is input on a separate call to the User subroutine INPUT. Immediately before the main program calls INPUT, it must read an 80 column alphanumeric Title Card, which is used as a heading for that particular character display. Any Parameter Cards, Title Cards, or Data Cards that subroutine INPUT requires must be positioned after this Title Card. This card order is followed for a complete group of input grids. After a group of grids have been processed, the User has the option to process another group of input grids or to finish the run. If a next group is desired, a card with the word END in Cols. 1-3 must follow the last group of data input and the process is repeated. If a finish is desired, a card with the word FINISH in Cols. 1-6 must follow the last group of data input.

RESERVED NAMES: The following names may not be used by the User:

Entry Points

1. CHRDSPLY

2. SETUP
3. SETUPS
4. CONVERT
5. DUPLICAT

Common Blocks

1. /1/

2. /B1/

LOADING : The following BANK cards should be used with the program:

$\substack{11\\0\\7\\9}$BANK, (1), /B1/

$\substack{11\\0\\7\\9}$BANK, (0), ALL.

The following DEMAND card should be used with the program:

$\substack{7\\9}$DEMAND, 16000

OUTPUT : A character display associated with a grid is output in a series of strips with each strip a maximum of 128 columns. Each strip will include all rows of the grid.

WARNING : A large number of overprints per line tends to punch holes in the printer paper. One or two overprint character sets are generally sufficient for a complete range of gray scales (if required at all).

## SUMMARY OF CARD ORDER

1. $\substack{7\\9}$JOB,0025,0717/SMITH,10

2. $\substack{7\\9}$PRINTALL

3. $\substack{7\\9}$DEMAND,16000

4. Any TAPE, EQUIP, and REMARK Cards

5. $\substack{7\\9}$FTN,L,X,A,R,P

6. Source Deck of Subroutine INPUT

7. SCOPE Card

8. $\substack{11\\0\\7\\9}$BANK,(1),/B1/

9. $\substack{11\\0\\7\\9}$BANK,(0),ALL.

10. $\substack{7\\9}$LOAD

11. RBD of CHRDSPLY

12. $\substack{7\\9}$RUN,10,99999,1

13. Main Parameter Card

14. Main Character Set Card(s)

    First Overprint Character Set Card(s)-if needed

    Second Overprint Character Set Card(s)-if needed

    *****

    Include all overprint sets

    *****

15. Non-uniform Intervals Card(s) -if needed

16. Title Card of Grid to be read by Subroutine INPUT

17. Any Parameter, Title, or Data Cards read by Subroutine INPUT

    *****

18. Repeat steps 16-17 as often as necessary

    *****

19. END Card if steps 13-18 are to be repeated

    FINISH Card if run is over

PROGRAM : CONTOUR

LANGUAGE : 3600 Fortran/Compass

COMPUTER : 3600

PROGRAMMER : Eric A. Smith

DATE : July 21, 1967

PURPOSE : This is a general contouring program designed to allow the User to specify the horizontal and vertical projection, and the contour levels. The contour map is outputted on the calcomp plotter with the individual lines labeled if requested.

USAGE : The program requires that the User write his own input subroutine. The program directs calls to this routine with a CALL INPUT(IDIM1, IDIM2, GRID) statement, where IDIM1 = the number of columns and IDIM2 = the number of rows(read from a control card prior to the call as will be explained) of the input area GRID (GRID is a floating-point array). Since GRID is a linear array, the subroutine must make provisions for storing the elements in a linear format, i.e., row wise. After the input routine is prepared, the subroutine deck should be placed in the program deck, following 3600 program order rules. If this subroutine requires the reading of cards, note that they must be positioned so as not to interfere with the main program control cards (see below).

The program is set up to process groups of input grids under one set of parameters with the provision of reinitiating the parameters for a second group and so on. The following information is required on control cards:

Main Parameter Card

Col. 1-3: Number of columns of current group of input grids ($2 \leq NC \leq 200$).

Col. 4-6: Number of rows of current group of input grids ($2 \leq NR \leq 200$).

Limitation: NC x NR cannot exceed 16000.

Col. 7-12: Width of contour map (F6.2 format; this is the X distance on the plotter; cannot exceed 150.0; if this parameter is blank or out of limits, it will be set to 10.0),

Col. 13-18: Height of contour map (F6.2 format; this is the Y distance on the plotter; cannot exceed 30.0; if this parameter is blank or out of limits, it will be set to 10.0).

Col. 19-20: Number of contour levels ($1 \leq NCL \leq 48$ ; if this parameter is blank or out of limits, it will be set to 5).

Col. 21: 0 or blank specifies that uniform contour levels will be used requiring the specification of the following two parameters.

1 specifies that non-uniform contour levels will be used, requiring the reading of a Contour Levels Card(s).

2 specifies that the program will set up the desired number of contour levels with their values based on the standard deviation of the grid values.

Col. 22-31: If Col. 21 is 0 or blank, this parameter specifies the minimum contour level; otherwise leave blank (use a F10.4 format).

Col. 32-41: If Col. 21 is 0 or blank, this parameter specifies the uniform spacing between the contour levels; otherwise leave blank (use a F10.4 format).

Col. 42: 0 or blank specifies that the horizontal grid spacing (spacing between columns) is uniform and will be calculated from the grid column dimension and the contour map width.

1 specifies that the horizontal grid spacing is non-uniform, requiring the reading of a Horizontal Grid Spacing Card(s).

Col. 43: 0 or blank specifies that the vertical grid spacing (spacing between rows) is uniform and will be calculated from the grid row dimension and contour map height.

1 specifies that the vertical grid spacing is non-uniform requiring the reading of a Vertical Grid Spacing Card(s).

Col. 44: 0 or blank specifies that contour labeling will be used requiring the specification of the following two parameters,

1 specifies that contour labeling will not be used.

Col. 45-50: Desired height of contour labels (use a F6.4 format; $0 < H \leq 1$; if this parameter is blank or out of limits it will be set to 0.1).

Col. 51-56: 4-6 character floating point format of the form Fxx.yy specifying the format of the contour labels (which are the contour levels themselves). E.g., if the contour levels range from 0.25 to 0.75 the format must read F4.2. This field must not be left blank if labeling is desired and if used, must be left justified.

Col. 57: 0 or blank if contour smoothing is desired.

1 if contour smoothing is not desired.

Col. 58-59: Specifies logical tape unit onto which maps are plotted (1 ≤ LUN ≤ 49; if left blank or out of range, LUN is assigned to 62, i.e., the standard plotter unit).

Contour Level Card(s)(Optional)

If Parameter 6 of the Main Parameter Card contains a 1 punch, this card(s) contains in an 8F10.4 format the desired contour levels in ascending order.

Horizontal Grid Spacing Card(s) (Optional)

If Parameter 9 of the Main Parameter Card contains a 1 punch, this card(s) contains in an 8F10.4 format the desired spacings between columns starting from the left of the map. Note that the first spacing is measured between the map border and the first column and the last spacing is measured between the final two columns, thus yielding the same number of spacings as there are columns.

Vertical Grid Spacing Card(s) (Optional)

If Parameter 10 of the Main Parameter Card contains a 1 punch, this card(s) contains in an 8F10.4 format the desired spacings between rows starting from the bottom of the map. Note that the first spacing is measured between the map border and the bottom row and the last spacing is measured between the two topmost rows, thus yielding the same number of spacings as there are rows.

Title Cards and Subroutine INPUT Cards

After these parameters are read, a group of input grids may be processed. Each grid is input on a separate call to the User Subroutine INPUT. Immediately before the main program calls INPUT, it must read an 80 column alphanumeric Title Card, which is used as a heading for that particular contour map. Any Parameter Cards, Title Cards, or Data Cards that subroutine INPUT requires must be positioned after this Title Card. This card order is followed for a complete group of input grids. After a group of grids have been processed, the User has the option to process another group o input grids or to finish the run. If a next group is desired, a card with the word END in Cols. 1-3 must followed the last group of data input and the process is repeated. If a finish is desired, a card with the word FINISH in Cols. 1-6 must follow the last group of data input.

RESERVED NAMES: The following names may not be used by the User:

Entry Points

1. CONTOUR
2. TABLES
3. E1
4. E2
5. E3
6. E4
7. E5
8. SMOOTH
9. NOTFIN

Common Blocks

1. /1/
2. /B1/
3. /B2/

LOADING : The following BANK cards should be used with the program:

$\begin{smallmatrix}11\\0\\7\\9\end{smallmatrix}$BANK,(0),/1/

$\begin{smallmatrix}11\\0\\7\\9\end{smallmatrix}$BANK,(1),ALL.

The following DEMAND card should be used with this program:

$\begin{smallmatrix}7\\9\end{smallmatrix}$DEMAND,16002

OUTPUT : The output will be produced on the calcomp plotter, as a map of the specified size with title information printed below the map.

## SUMMARY OF CARD ORDER

1. $\substack{7\\9}$JOB,0025,0717/SMITH,10

2. $\substack{7\\9}$PRINTALL

3. $\substack{7\\9}$DEMAND,16002

4. Any TAPE, EQUIP, and REMARK Cards

5. $\substack{7\\9}$FTN,L,X,A,R,P

6. Source Deck of Subroutine INPUT

7. SCOPE Card

8. $\substack{11\\0\\9}$BANK,(0),/1/

9. $\substack{11\\0\\7\\9}$BANK,(1),ALL.

10. $\substack{7\\9}$LOAD

11. RBD of CONTOUR

12. $\substack{7\\9}$RUN,10,99999,1,,,,999

13. Main Parameter Card

14. Non-uniform Contour Levels Card(s)-if needed

15. Non-uniform Horizontal Grid Spacings Card(s)-if needed

16. Non-uniform Vertical Grid Spacings Card(s)-if needed

17. Title Card of Grid to be read by Subroutine INPUT

18. Any Parameter, Title or Data Cards read by Subroutine INPUT

    *****

19. Repeat steps 17-18 as often as necessary

    *****

20. END Card if steps 13-19 are to be repeated

    FINISH Card if run is over

August 18, 1967

PROGRAM : .IOPACK.

PROGRAMMER : John Benson

LANGUAGE : COMPASS

PURPOSE : 3600 Tape Handling

DESCRIPTION : Some of the entry points to .IOPACK. modify Fortran usage, while others expand the class of operations available to the central program. When a call is used to one of these entry points (except for Q8QIFUNI) the system hangs until the unit is quiet. Then an IO request is initiated and control is returned to the calling program. Errors may be checked for, but if they are not, they are ignored. A thorough knowledge of the tape contents is necessary to make use of .IOPACK. No standard references (READ, WRITE) should be attempted on a unit after a call to any of these entry points.

DESCRIPTION OF ENTRY POINTS:

LUNCHMMM
MUNCHMMM

These are dummy entry points necessitated by program logic. They are of no use to you or to anybody else.

BFO.

Called implicitly by a fortran BUFFER OUT statement, it is probably equivalent to the systems version.

BFI.

Called implicitly by a fortran BUFFER IN, this routine does not perform retries after parity errors: if retries are desired, they must be written into the logic of the main program. One word records other than file marks can not be read.

Q8QIFUNI

Called implicitly by the fortran IF UNIT statement, this routine gives information about the status of a logical unit. A 4-branch or 3-branch IF UNIT statement is useful only after BUFFER IN or READPART. Note that the 4th branch now only indicates the existence of a parity error and not its intransigence.

READPART (N,M,A,I,K)

Skips N words of a record and reads M words into array A from unit I in parity K. N may be zero but must not be negative. If N + 1 is greater than the length of the present record on unit I, reading will start at the beginning of the next record. Therefore, READPART should not be used when the programmer is uncertain of the contents of the tape. The operation will be terminated by a file mark anywhere, or by end of record after the beginning of the read phase.

```
SKIPREC  (N,I)
BACKREC  (N,I)
SKIPFIL  (N,I)
BACKFIL  (N,I)
```

Performs the indicated action N times on unit I. No check is made for file marks in SKIPREC or BACKREC.

LENGTHF(I)

Will return the number of words buffered in on the last operation on unit I if and only if

1) The last operation on Unit I was a Buffer In

2) Unit I is the last unit for which there was a Buffer In request.

Essentially, I is a dummy and a call to LENGTHF will return the length of the last record input, regardless of I. However this parameter <u>must</u> be present.

PROGRAM : PUT

LANGUAGE : FTN/Compass

COMPUTER : 3600

PROGRAMMER : John Benson

PURPOSE : Binary Card Input/Output

USAGE : CALL PUT(A,N)
will output N computer words starting from location A onto binary cards; 19 words per card. Each card is sequenced and check-summed. Last card output is a SCOPE end-of-file card.

CALL GET (A, N)

inputs cards previously produced by PUT. Last card read by each call to GET must be a SCOPE end-of-file card.

**Note: .IOPACK. must be used in conjuction with this subroutine.**

# ATS APPLICATION PROGRAMS

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PROGRAM : ATSCOPY

LANGUAGE : F-63

COMPUTER : 3600

PROGRAMMER : Eric Smith

DATE : January 4, 1966

PURPOSE : Produce a straight copy of an ATS digitized raw data tape onto two output tapes.

USAGE : Input tape is given logical unit number 1. Output tapes are given logical unit numbers 2 and 3 (if two tapes are used).

Two control cards are needed.

First control card: This card specifies the minimum and maximum record lengths (words) that are considered acceptable. If a record length fails to stay within these limits, a record dump and diagnostic is output.

Col. 1 - 4 : Minimum acceptable record length (words).
Col. 5 - 8 : Maximum acceptable record length (words).

Second Control Card: This card specifies a parity error parameter, a verification parameter and a record number at which the second output tape is initiated.

Col. 1 : Set to 0 if a terminate is desired after 50 parity errors. Set to 1 if no terminate is desired on parity errors.

Col. 2 : Set to 0 if no verification is desired. Set to 1 if verification is desired on first 10 records.

Col. 3 - 6 : Specify record number at which second output is desired. All records up to and including this specified record will be output on the first output tape. All following records will be output on the second tape. If this parameter is left blank only 1 output tape is needed and therefore a logical unit number 3 should not be specified.

## SUMMARY OF CARD ORDER

1. $\overset{7}{9}$JOB,0025,0717/SMITH,10
2. $\overset{7}{9}$PRINTALL
3. Any EQUIP,TAPE, and REMARK Cards
4. RBD of ATSCOPY
5. $\overset{7}{9}$RUN,10,99999,1
6. First Parameter Card
7. Second Parameter Card

PROGRAM : ATSBDUMP

LANGUAGE : F-63/Compass

COMPUTER : 3600

PROGRAMMER : Eric Smith

DATE : January 3, 1967

PURPOSE : Decimal dump of specified records on a one mil ATS-B raw data tape.

USAGE : Assign tape to be dumped to logical unit number 1.

Specify on consecutive control cards an initial record to be dumped and the number of following records to be dumped. Terminate job with a blank control card.

Control Card Format

Col. 1-4: A record number to strart dumping.
Col. 5-8: Number of records to be dumped in this series, including initial record.

## SUMMARY OF CARD ORDER

1. $^{7}_{9}$JOB,0025,0717/SMITH,10

2. $^{7}_{9}$PRINTALL

3. Any EQUIP, TAPE, and REMARK Cards

4. RBD of ATSBDUMP

5. $^{7}_{9}$RUN,10,99999,1

6. Main Parameter Card

*****

7. Repeat step 6 as often as necessary

*****

8. Blank Card

PROGRAM : ATSCDUMP

LANGUAGE : F-63/Compass

COMPUTER : 3600

PROGRAMMER : Eric A. Smith

DATE : January 3, 1967

PURPOSE : Decimal dump of specified records on an ATS-B cropped tape, or an ATS-C raw tape, or and ATS-C cropped tape.

USAGE : Assign tape to be dumped to logical unit number 1.

Specify on consecutive control cards an initial record to be dumped and the number of following records to be dumped. Terminate job with a blank control card.

Control Card Format

Col. 1-4: A record number to start dumping.
Col. 5-8: Number of records to be dumped in this series, including initial record.

## SUMMARY OF CARD ORDER

1. $^{7}_{9}$JOB,0025,0717/SMITH,10

2. $^{7}_{9}$PRINTALL

3. Any EQUIP, TAPE, and REMARK Cards

4. RBD of ATSCDUMP

5. $^{7}_{9}$RUN,10,99999,1

6. Main Parameter Card

*****

7. Repeat step 6 as often as necessary

*****

8. Blank Card

PROGRAM : MENAGE

LANGUAGE : 3600 Fortran, Compass

PROGRAMMER: M. Mantei

DATE : December 21, 1967

PURPOSE : Program MENAGE reads and edits the ATS-B picture data tapes.

OPERATION AND USAGE:

Any number of input tapes up to 20 can be processed and the data written onto any number of output tapes not exceeding 10. Multi-files can be written on each output tape with any defined data block. No greater than 7200 elements per record should be requested for each block, and the first element requested must be greater than 18. If the number of files per input tape option is left blank, the program will set up to process an entire input tape removing for output, elements 500-7700 of each record. Data blocks requested can overlap and the order of reading data blocks need not be sequential, e.g., records 1000 to 1500 may be processed before records 500-900 on any given input tape. (It should be noted that it is cheaper computer-time-wise to process data blocks as sequentially as possible.)

The program crops off the double zeroes preceding each 16 bit data word and realigns any data containing bit drops or adds, or character drops or adds. The efficiency of this realignment routine can be specified by a parameter listing how many words to search ahead in verifying alignment, but again computer time is also a consideration in setting this parameter. If the realignment routine cannot re-orient the data, the previous good record is written out in place of the misaligned one. This occurrence is indicated by double asterisks on the output listing of the record numbers copied. A misaligned record that has been corrected is shown by a single asterisk. If the first record of a file is not alignable, all one's are written into the output record. The documentation data of each bad record is preserved whether the record is a rewrite or all ones. The documentation data is the first three words of any output record. The fourth word is the first data word. This is written over by either all ones (in binary) to indicate a rewrite or all ones except for the 48th bit (in binary) to indicate a good record. These would appear on the octal dump as follows:

```
1.  3777777777777777      good record
2.  7777777777777777      rewrite
```

The number of not alignable records allowable is also a variable parameter. The program dumps the first ten data records of each file written on tape.

Program MENAGE has a date checking option which will ask the operator to verify if the input tape loaded is correct when the documentation data date does not agree with that listed on the parameter card. It should be noted that after tape ATS-B-396, the documentation data does not contain the correct date or it is missing entirely. This may be restored by January, but this option should probably only be used in multi-tape processing where there exists a chance for operator error.

The program has three versions which are specified on a parameter card. They are as follows; Version (1) carry out all processing, Version (2) bypass realignment routines, rewriting all misaligned records, or Version (3) bypass all checking for alignment. If a run is being executed on a tape which is almost free of parity errors, Version 3 will be the most economical. If there are a small number of bad spots on the tape, Version 2 will produce an economical run while still preserving most of the data. Version 1 is usually used for tapes of unknown status, small file runs and tapes with many parity errors for which the value of the data demands the necessary expenditure.

Program MENAGE is on library tape S8400 at Sterling Hall so that all that is needed to submit is a deck with the necessary system control cards and parameter cards. A description of these cards follows the tape formats. A sample listing of the output of program MENAGE is also attached.

NOTE: A binary deck exists for which one can copy only every tenth record, but this is not an option on the library copy of MENAGE.

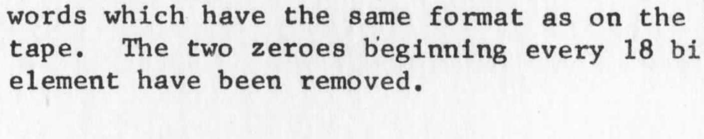
**TAPE FORMAT:** Input Tape;

The input format is as printed in the Westinghouse report. These tapes do not necessarily begin at record one and their record counts are variable.

Output Tape;

Record Description:

1. Each 48 bit word of a record contains 6 data words packed as follows:



2. The first three words of a record are the documentation words which have the same format as on the initial data tape. The two zeroes beginning every 18 bit documentation element have been removed.

Tape Description:

1. The first record of the tape is an 80 character tape label generated by the 3600.

2. The first record of each file is an 80 character file label listing the picture number and the dimensions giving the data's location on the input tape. This is written in binary mode.

3. An end-of-file is written after each file on the tape. The last file contains two ends-of-files after the last data record. These are preceded by an end-of-file and an 80 character trailer label.

SAMPLE SUBMITTAL DECK:

For this sample deck, the following options will used: Input; Three input tapes labeled ATS-B-127, ATS-B-131, and ATS-B-135. Three files are to be removed from the first tape and one each from the remaining two tapes. The areas removed for each file are as follows:

Tape ATS-B-127 Picture No. 116-7-202700-23

| | | |
|---|---|---|
| File 1 | Record 100-119 | Element 500-7700 |
| File 2 | Record 1510-1569 | Element 1000-3200 |
| File 3 | Record 1550-1650 | Element 3000-4000 |

Tape ATS-B-131 Picture No. 116-7-224704-29

| | | |
|---|---|---|
| File 1 | Record 540-669 | Element 500-7700 |

Tape ATS-B-135 Picture No. 106-7-234153-39

| | | |
|---|---|---|
| File 1 | Record 210-219 | Element 550-7700 |

Output; Two output tapes labeled CROPB12 and CROPB13. The first tape will contain the first three files and the second one the remaining two files. These labels will be assigned in accordance with the UW Meteorology tape library system.

Version No. 1 is to be used and 50 bad records will be allowed before job termination. If 20 elements are found aligned after correcting for a misalignment, the record will be considered realigned, but if 10 unaligned elements arise, the correction for misalignment is considered invalid and another correction is tried until an alignment is found. The 16 character output tape label will be HURRICANE 1 TEST. (This label is anything which will help the user better identify his job. It is only for printer output and may be left blank.)

Date checking will be carried out on each of the input tapes.

SAMPLE SUBMITTAL DECK:

Control Card Section:

1. Input tapes alternate assignment between logical unit numbers (lun's) 1 and 3.

2. Output tapes alternate assignment between logical unit numbers 2 and 4.

3. An equip card must be punched for each input logical unit used and a relabel card for output tapes. These output tapes should be blank labeled prior to usage if they are not newtapes.

4. A description of the job, tape, library, unload, and equip cards can be found in the CDC drum scope manual. The relabel card is described in UWCC PSM.5: 1966, Supplement 3, page 5.

5. A library request card must be filled out at submittal time requesting library tape (S8400) from the UWCC library. There should be no write ring requested.

SAMPLE SUBMITTAL DECK:

CONTROL CARD SECTION:

PARAMETER DECK

```
18 / 12345678910 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
17 /7/9MENAGE
16 /7/9RELABEL,4=FROM**,TO(CROPB 13),HY
15 /7/9EQUIP,3=**,HY,RO,DA
14 /7/9RELABEL,2=FROM**,TO(CROPB 12),HY
13 /7/9EQUIP,1=**,HY,RO,DA
12 /7/9TAPE,ASSIGN TAPE(CROPB 13) TO LUN 4
11 /7/9TAPE,PLEASE BLANK LABEL TAPE(CROPB 13)
10 /7/9TAPE,ASSIGN TAPE(ATS-B-131) TO LUN 3
9  /7/9TAPE,ASSIGN TAPE(CROPB 12) TO LUN 2
8  /7/9TAPE,PLEASE BLANK LABEL TAPE(CROPB 12)
7  /7/9TAPE,WHEN TAPE(ATS-B-127) REWINDS, ASSIGN TAPE(ATS
CONT  -B-135) TO LUN 1
6  /7/9TAPE,ASSIGN TAPE(ATS-B-127) TO LUN 1
5  /7/9UNLOAD,40
4  /7/9LIBRARY,40,LSSEC
3  /7/9EQUIP,40=(SSECLIB)
2  /7/9TAPE,MOUNT TAPE(S8400)
1  /7/9JOB,1847,3988/MANTEI,5
     12345678910 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46
```

SAMPLE SUBMITTAL DECK;

PARAMETER CARD SECTION:

```
CARD
COLS.  1234567891O 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

29 /0210 0219 0550 7700

28 /106 106-7-234153-39   01

27 /0540 0669 0500 7700

26 /116 116-7-224704-29   01
    THE REMAINING PORTION OF THE PARAMETER DECK REPEATS CARDS 22 AND
    23 AS FOLLOWS:

25 /1550 1650 3000 4000

24 /1510 1569 1000 3200                       FILE CARDS FOR 1ST TAPE
    REC NO.-REC NO. ELEM.-ELEM.

23 /0100 0119 0500 7700

  IF BLANK NO DATE CHECK.
    DATE          PICTURE NO          NO. OF FILES TO BE REMOVED FROM THIS TAPE

22 /116 116-7-202700-23   03

     COUNT OF GOOD ELEMENTS TO CHECK FOR ALIGNMENT
        COUNT OF BAD ELEM.  NO. OF ALLOWABLE BAD RECORDS/FILE

21 /020 010 0050
    NO. OF FILES ON 1ST OUTPUT TAPE
        NO. ON 2ND

20 /03 02

    1ST INPUT TAPE NO.
           2ND  3RD

19 /127 131 135
                                             NO. OF INPUT
                      VERSION                TAPES      NO. OF OUTPUT TAPES
       DATE              NO    OUTPUT TAPE LABEL

18 /12/30/67 01 HURRICANE 1 TEST 03 02
    1234567891O 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50
```

```
SEQUENCE 01083 STARTED  PRINTING 02/07/68 AT 135605 ON LP00
UWCC DRUM SCOPE VERSION 2.02A 01/12/68
SEQUENCE NUMBER 501083 STARTED AT TIME  135308  DATED  02/07/68
JOB,1847,3988/MANTFI,10
TAPE,MOUNT TAPE(S8400)
EQUIP,40=(SSECLIB)
LIBRARY,40,LSSEC
UNLOAD.40
TAPE,ASSIGN TAPE(ATS-B-127) TO LUN 1
TAPE,ASSIGN TAPE(ATS-B-127) TO LUN 1
TAPE,WHEN TAPE(ATS-B-127) REWINDS,ASSIGN TAPE(ATS-B-135) TO LUN 1
TAPE,PLEASE BLANK LABEL TAPE(CROPB 12)
TAPE,ASSIGN TAPE(CROPB 12) TO LUN 2
TAPE,ASSIGN TAPE(ATS-B-131) TO LUN 3
TAPE,PLEASE BLANK LABEL TAPE(CROPB 13)
TAPE,ASSIGN TAPE(CROPB 13) TO LUN 4
EQUIP,1=**,HY,PO,DA
RELABEL,2=FROM**,TO(CROPB 12),HY
EQUIP,3=**,HY,RO,DA
RELABEL,4=FROM**.TO(CROPB 13).HY
MENAGE
```

4.8

```
RECORD 100   PICTURE IDENTIFICATION NO.116-7-202700-23

0002100037600377 0001300020000000 0000400000200024 3777777777777777 0000000000
0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000
0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000
0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000
0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000
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0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000
0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000
0000000000000000 0000000000000000 0000000000000000 0000000000000000 00200401002
0020040100200000 0020000100200401 0020040100200401 0020040100200401 0000040000
0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000
0000000100200401 0020040100200401 0020040100201001 0050100300601002 0000100000
0000000000000000 0000000000000000 0000000000000000 0000000000000000 00000001002
0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000
0000000000000000 0000000000000000 0000000000000401 0020040000000000 0000000000
0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000
0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000
0000000000000000 0000000000000000 0000000000000000 0000000000000000 00000001002
0020040000200000 0000000100200001 0000000000000000 0000000100200401 00200400002
0000000100000401 0000040000000000 0000000000000000 0000000000000000 0000000000
0000000000000401 0020040000200401 0020040100200401 0020040100200401 00200401002
0000000100000401 0000000100200401 0020040000200000 0000000000000000 0000000000
0000000200000400 0000000100200401 0020040200201002 0060140600602404 0160341101
0501342505614434 0641543206617036 0641603607014434 0761744210217462 0761744310
1122344311626052 1222345111622455 1422746113627057 1242605012626052 1262545612
1362546113631077 1443146114633463 1443106114633063 1503106515034467 156334721
1563746716232467 1563606715433467 1703346715233467 1563207215435467 1643707717
2123647421041504 2045050137441101 2064010524236574 2065250337440475 1707147417
1703710315637476 1603547315636066 3745047017437477 2023710120637103 2065050117
1563547116637071 1703607617437476 1763647517643477 1725050517241107 214431172
2124250720642507 2124251121641507 2224511123243513 2124551321643507 2164351121
2344551322443112 2324751122243507 2204311022043507 2264511221645110 214435122
2345052223046116 2324651222243512 2144711722646116 2244511521645111 234451132
2324611123243106 2064510121642506 2004047425234077 1643607215435073 154340701
```

```
PICTURE IDENTIFICATION NO. 116-7-202700-23      ATS-B-127

PROGRAM MENAGE  VERSION 1

OUTPUT TAPE HURRICANE 1 TEST

FILE NO.  1

RECORD  100 TO  119

ELEMENT  500 TO 7705


ATS-B FILE I/O STATISTICS

          20 RECORDS READ

          20 RECORDS WRITTEN

          13 RECORDS IN ERROR
```

4.10

```
PICTURE NO. 116-7-202700-23      OUTPUT TAPE HURRICANE 1 TEST      FILE NO.  1
ATS-B RECORD LISTING          DOUBLE ASTERISKS INDICATE REWRITE      SINGLE ASTERIS
  RECORD NO  RECORD NO  RECORD NO  RECORD NO  RECORD NO  RECORD NO  RECORD NO  R
     114        111
```

RECORD1510 PICTURE IDENTIFICATION NO.116-7-202700-23 4.11

```
0003040037600376 0000300020000000 0000400005200021 3777777777777777 0000000000000
0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000600000000
0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000000
0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000000
0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000000000000
0000000000000000 0000000000000000 0000000000000000 0000000000000000 0000500000000
0000000000000000 0000000000000000 0000000000000000 0020040100000401 002004010020040
0040040100401002 0040100200401002 0040100300601003 0040100301601407 012014050100300
0421542325617027 1142345711433477 1643307615633463 1643707017435077 1643507516635
1723707517637476 1727750320241577 2067750720447136 2465752327650136 22455515276445
2024310337636074 1767647137636477 1743607217437077 1643707117634473 17435473176364
1767707620636563 1763750117634473 1743747117233475 1623546615432467 15634465176334
1563346715633067 1543306515633477 1543746717233476 1463546617433473 15433065156324
1403106114631463 1643145717430062 1403705613425455 1302745413625453 12225447136244
1202505312425453 1342545513030457 1202745413625452 1162444712624056 12427451126230
1262504713226456 1102545111624057 1222745312625047 1142304712423456 12227047122244
1122745113623047 1242344711623047 1142345113433457 2224246734633067 15036457170264
1322505113623455 1162544611421447 1102345111623047 1222304613422452 11223451116250
2365552425656135 3627654135644527 2064552727452535 2425610523246116 27667547354645
1643706714627462 1362745713630476 1503106315033467 1663350137645507 20273470174310
1262345312625453 1302705513425457 1343750734661162 3027750626636177 17675516246571
3527116437670576 3226755431667556 3367755634662146 2727312725645114 21646111222475
3327056133667157 3167512727457537 2765514136663543 3306715737471561 35073564354631
2144712727650122 2745352425455527 2264710621643507 2104210721643507 21643505216405
2064250121641577 1723546515634467 1563747635442104 2105213535261545 26272515272435
1603746717432466 1663547016433466 1423205514225457 1322745113626457 12226053136234
1242705013424052 1302645413231476 1727150334230477 1443146014041577 26267557336735
1704211731672566 3747356737104374 4270756745463563 3066113731457161 22451074364330
1627247536231471 1563546017431476 1543345616424453 1242745113424447 11623444116230
[illegible]235560517633574 2305252324670177 3627757337675573 3107150636633070 22275122246315
[illegible]43505212625056 1323706714630462 1563752737655563 3347516034472560 33470566354745
1543506615627062 1423146114026057 1242504711623447 1162344312221445 11623443106214
1103704317617042 1002004010421046 1022303717622077 0742104710433467 16675473206405
1102244611423042 1363347216641577 2766756336676563 3747756537502177 41177573403022
3027251427244114 3727546716643576 2324610123236570 1463545413425453 13227461176361
1363746117640475 1463406216643573 2327545516224453 1362745217436162 37474477164411
2067346214626462 1342745113426057 1302705513030475 1627351321654523 27653507356345
1423346714437073 1363344613422445 1122644712622446 1002304210617463 07237437102220
1162344111620463 0761744517623043 1142304614617477 1423346715427077 23677505204525
1322506417643577 2265150037637173 2165153225632160 1222445113632557 26657525274365
1042303710621062 0763744010617062 0761703607415034 0741643707216437 07417433070160
0661543306014033 0561503406417036 0701703306415433 0741743407415036 07217435076170
1002244311627066 1623706717633067 1563747316641577 2465352735662551 30665541326655
3346714631460547 3627757136676165 3567756637472166 3066154634457137 25457533254515
2204753327655533 2767714231457144 2726255131063555 3346754231663547 31262545330625
3327616734675167 3627716637475167 3771020477700620 3647556634677573 36471155350725
3527356734672567 3627560036676177 4007620740501603 4230361340704617 45317621457146
4671162747517236 4451322145512625 4731362245706226 4310720141100601 37771566364705
2565552624650134 2364651222036575 2023647317636077 1747710320636563 17237063146310
1303310737646117 2647707737650537 2465152327645515 2364557630632072 13431054174314
1563546715637472 1403206116025457 1362746217633473 1343345414430476 14631466146374
1302645013427077 1443150337643517 2324351423447537 3047354533455543 34275573346751
4070162143510627 4571260755276577 3567557754102373 4170320741702666 37777607411036
4671563546716637 4411761354502177 3773117770705204 3773317137677173 36700177545023
4017560354700377 4270361443505236 4331321645717263 5272364455510627 41717606435026
[illegible]07720477677662 3527756534271563 3307317774507616 4350761647700624 42306620477136
[illegible]473122754713626 4351362546110234 4310720342707216 4470722242704763 37677571376731
3567316137465177 3577120645500177 3227754632667576 3627057336667563 36477163344735
4130260743301617 4110321243707616 4330721747306622 4230722347310621 44711617437032
4150020443507232 4431062644166215 4270501243706217 4410720543513637 43113613435142
4571362445115625 4731251544306233 4410720743503607 4050360677474177 34473547356575
```

4.12

```
PICTURE IDENTIFICATION NO. 116-7-202700-23       ATS-B-127

PROGRAM MENAGE  VERSION 1

OUTPUT TAPE HURRICANE 1 TEST

FILE NO.  3

RECORD  1550 TO 1650

ELEMENT 3000 TO 4001

ATS-B FILE I/O STATISTICS

        101 RECORDS READ

        101 RECORDS WRITTEN

          0 RECORDS IN ERROR
```

4.13

```
PICTURE NO. 116-7-202700-23      OUTPUT TAPE HURRICANE 1 TEST      FILE NO.  3  .
ATS-B RECORD LISTING         DOUBLE ASTERISKS INDICATE REWRITE      SINGLE ASTERIS
 RECORD NO  RECORD NO  RECORD NO  RECORD NO  RECORD NO  RECORD NO  RECORD NO  R
      1551       1561       1571       1581       1591       1601       1611
      1651
```

PROGRAM : ATSB/EDITOR-EDIT/ATSB

LANGUAGE : ALGOL

COMPUTER : B5500

PROGRAMMER : John Benson

DATE : January 1, 1968

PURPOSE : This is a program for editing selected portions of ATSB data tapes, the output options are:

1. Cropped tape output
2. Octal dump on printer
3. Printed statistical information

Any combination of these outputs may be selected originally, and the selection of printer dumps and statistics may be varied from one set of lines to the next.

USAGE : The program is executed by submitting a program control deck, preceeded by the systems control card:

```
?USER#25U717;EXECUTE ATSB/EDITOR;DATA DECK
```

This card calls out the program ATSB/EDITOR which performs initialization and then transfers control to the main program EDIT/ATSB.

Before submitting a run, it is necessary to check the disk directory to assume the availability of the following two programs:

```
ATSB/EDITOR
EDIT/ATSB
```

If they are not on disk, they should be loaded from the library tape U7041, or compiled from a source deck.

Note: Warn the operator if you are handing in a virgin output tape, because he must write something on it before it can be mounted on the B5500.

Program Control Deck

The program reads a deck of cards which indicate what is to be done. The set of characters used in the control deck can be limited to numbers, letters, and the three special characters "$",".", and ",". This allows the deck to be produced on either an 026 or 029 keypunch.

The deck consists of program control cards, which have a "$" in col. 1, and comment cards, which do not. A comment card produces no effect other than to appear in the printed output.

Control cards contain, in addition to the "$", a code word and possibly also a parameter list or an operator message.

The code word on a control card must begin in col. 2 and contain no embedded blanks, but the parameter list is free field up to col. 72. Parameters are separated from the code word and each other by commas.

### Operator Comment (SPO)

The code word SPO signifies that a message should be sent to the B-5500 operator. The card format is:

```
$SPO,  (operator message).
```

resulting in a typeout on the operator's console:

```
#EDIT/ATSB:   (operator message)
```

The message should not exceed 59 characters and the card must contain both the comma, which denotes the beginning of the message, and the period which terminates it.

### Define Output Tape (TAPE)

The Card:
$TAPE, (operator message). signifies that there is to be tape output.

The operator message is saved and typed out right before the output tape must be assigned by the operator. This message must also terminate with a period.

### Define Input Tapes (ATSB)

The input tape names are given to the program by a card with the code word ATSB. For example:

```
$ATSB,50,52
```

indicates that the first input tape will be ATSB-50 and the second will be ATSB-52. From one to three tapes can be specified.

### Set Cropping Parameters (CROP)

The CROP card contains two integer parameters. The first is the starting element number and must be divisible by 16. The second is the output length in elements, and must be divisible by 120, and in the range from 120 to 6000.

```
Example:                $CROP,2752,1440
```

Elements are counted starting from 0, and the length includes 32 eight-bit "samples" of documentation. Thus, the first crop element cannot be less than 48.

The cropping parameters must be set initially, and can be reset at any time. Reseting the cropping parameters will begin a new file on the output tape.

### Specify Input Records (EDIT)

This card specifies a group of records to be processed on the present output tape. The statement can be in one of three forms. For example:

```
$EDIT,30
```

specifies processing of record 30

```
$EDIT,700,800
```

specifies processing of records 700 through 800

```
$EDIT,200,300,10
```

specifies processing of every 10th record from 200 through 300.

The group of records specified must not begin behind the present position of the input tape. After processing a group of lines specified by EDIT, the tape is positioned to do another record in the group. For example, after

```
$EDIT,7,8
```

the tape is positioned at record 9. After

```
$EDIT,700,800,5
```

the tape is at record 805.

WARNING : Record 1 must not be specified as a record to be edited.

Note: To find the number of the last record on a tape include the following card as the last card in the control card deck:

$EDIT,99999

The system in attempting to position the tape at record 99999 (which of course it won't find) will print out the number of the last record and then quit. However, if in trying to read and edit records, and the last record is reached, only a system diagnostic will appear.

The EDIT card actually causes processing of the lines specified, so the input and output tapes, and cropping parameters, must be assigned before the first EDIT statement is encountered by the program.

Change Input Tape (NEW)

The NEW statement calls for a new input tape and releases the old one, if any. Each input tape including the first, must be initialized with a NEW statement. The operator message must end with a period.

$NEW, (operator message).

Select No Tape Output (NOTAPE)

The NOTAPE card signifies that only printer output is desired.

Rewind Input Tape (REWIND)

The REWIND statement causes the input tape to be rewound. It must be used if an EDIT REQUEST would otherwise point to records behind the present position of the input tape.

Printer Output Options (DUMP)

The DUMP card has two integer parameters which set printer output options for all records until changed by another dump card. The first parameter is a key specifying the type of output wanted:

0 no dumps or statistics
1 octal dump of output record
2 statistics on output elements
3 both statistics and octal dump

The second parameter is the number of bits to use in the statistics--6, 7, or 8.

Printer Options for Misalligned Records (ERRDUMP)

The ERRDUMP card has 1 parameter, a key with the same meaning as the DUMP key. It specifies output only for those records which were found misalligned.

Change Output Files (NEXT)

The NEXT statement changes files on the output tape. This function is also performed by the CROP and NEW statements. There can be from 1 to 10 files on the output tape, labelled

ATS-B/FILE0 to ATS-B/FILE9

OUTPUT : Tape and octal dump printer output consists of 8-bit samples packed 6 per computer word. The first 32 sample positions contain documentation from the beginning of the input record and from the program.

| Sample Position on Output Record | Contents |
|---|---|
| 1-24 | 1st 24 samples of input record. |
| 25-26 | (first crop parameter-32)/16. |
| 27-28 | Record length in words = (2nd crop parameter)/6. |
| 29-30 | Record number on input tape. |
| 31-32 | Reserved for future documentation. |
| 33-... | Samples specified by crop parameters. |

The output tape is in standard B5500 label format. This means that to find the Nth data file on the 3600 you must skip over 2N-1 end-of-file marks.

Statistical output includes graphs of the distribution of samples and first differences, printout of the average and standard deviation of the samples, and a table giving the percentage of time that each bit position was turned on.

In addition to the optional dumps and statistical summaries, printer output always includes a listing of the control cards and comments as they occurr, and a line for each record processed, decoding the documentation from the beginning of the input record and stating that the allignment was found good or bad. If allignment is bad, the program attempts to correct it and its measure of success can be determined if the ERRDUMP option has been set.

The alignment error correction routine may throw away several samples, and may also leave a small batch of garbage in the middle of the line. ELEMENT NUMBERS MAY NO LONGER BE EXACT. The error correction routine works best with high-level signals.

Note: Use the control card $PRINTER if you will have a great deal of printer output.

TIMING : The base processor time for editing if no printer outputs are selected is about 2 x $10^{-4}$ seconds per element.

CONTROL CARD SUMMARY. TABLE I

| CODE WORD | FUNCTION | PARAMETERS |
|---|---|---|
| SPO | Operator Message | OPCOM |
| TAPE | Define Output Tape | OPCOM |
| ATSB | Define Input Tapes | 1-3 INTEGERS |
| CROP | Set Cropping Parameters | 2 INTEGERS |
| EDIT | Specify Input Records | 1-3 INTEGERS |
| NEW | Assign a new Input Tape | OPCOM |
| NOTAPE | Specify no Tape Output | NONE |
| REWIND | Rewind Input Tape | NONE |
| DUMP | Choose Printer Output Options for all Records | 2 INTEGERS |
| ERRDUMP | Choose Printer Output Options for Misalligned Records | 1 INTEGER |
| NEXT | Change Output Files | NONE |
| PRINTER | Request Line Printer Explicitly | NONE |

## SAMPLE RUN

```
?USER#25U717;EXECUTE ATSB/EDITOR;DATA DECK

$TAPE,OUTPUT TAPE IS SSEC 396.

$ATSB,52,50

$SPO,ASSIGN MY TAPES REGARDLESS OF PARITY.

$NEW,MOUNT ATSB 52 AT 800 BPI.

$CROP,3616,2400

$ERRDUMP,3

$DUMP,3,8

$EDIT,501

$DUMP,0

$EDIT,502,870

$NEW,MOUNT ATSB 50 AT 800 BPI.

$DUMP,3

$EDIT,499

$DUMP,0

$EDIT,500,869
```

PROGRAM : ATSCCROP

LANGUAGE : F-63

COMPUTER : 3600

PROGRAMMER: Eric A. Smith

DATE : February 14, 1968

PURPOSE : This program copies specified 1365 word lines from an ATS-C raw data tape, separating groups of records by END-OF-FILE-MARKS. A group of records consists of those records specified to be cropped on a single control card.

USAGE : Assign input tape to logical unit number 1. Assign output tape to logical unit number 2.

Specify on consecutive control cards an initial record to be cropped, a final record in the series, and a skip count (if desired). Terminate job with a blank control card.

Control Card Format

Col. 1-4: A record number to start cropping.

Col. 5-8: A final record number for this group (this may or may not be the final record depending on skip count).

Col. 9-12: Skip count (if desired).

EXAMPLES : 1: A control card with 8,50,2 as parameters, crops off records 8,10,12,14...,50, and ends up pointing record 51.

2: A control card with 10,100 as parameters (no skip count) crops off all records from 10 to 100, and ends up pointing at record 101.

3: A control card with 25,210,20 as parameters crops off records 25,45,65,85,...,185,205, and ends up pointing at record 206. Note that record 210 does not get cropped.

## SUMMARY OF CARD ORDER

1. $^{7}_{9}$JOB,0025,0717/SMITH,10

2. $^{7}_{9}$PRINTALL

3. Any EQUIP, TAPE and REMARK Cards

4. RBD of ATSCCROP

5. $^{7}_{9}$RUN,10,99999,1

6. Main Parameter Card

*****

7. Repeat step 6 as often as necessary

*****

8. Blank Card

PROGRAM : ATSC/EDITOR-EDIT/ATSC

LANGUAGE : ALGOL

COMPUTER : B5500

PROGRAMMER: John Benson

DATE : January 1, 1968

PURPOSE : This is an ATS-C "Pre-Look" program for editing selected full lines of an ATSC data tape; the output options are:

1. Octal dump on printer
2. Printed statistical information

The selection of printer dumps and statistics may be varied from one set of lines to the next.

USAGE : The program is executed by submitting a program control deck, preceeded by the systems control card:

```
?USER#25U717;EXECUTE ATSC/EDITOR;DATA DECK
```

This card calls out the program ATSC/EDITOR which performs initialization and then transfers control to the main program EDIT/ATSC.

Before submitting a run, it is necessary to check the disk directory to assume the availability of the following two programs:

```
ATSC/EDITOR
EDIT/ATSC
```

If they are not on disk, they should be loaded from the library tape U7041, or compiled from a source deck.

Program Control Deck

The program reads a deck of cards which indicate what is to be done. The set of characters used in the control deck can be limited to numbers, letters, and the three special characters "$", ".", and ",". This allows the deck to be produced on either an 026 or 029 keypunch.

The deck consists of program control cards, which have a "$" in Col. 1, and comment cards, which do not. A comment card produces no effect other than to appear in the printed output.

Control cards contain, in addition to the"$", a code word and possibly also a parameter list or an operator message.

The code word on a control card must begin in Col. 2 and contain no embedded blanks, but the parameter list is free field up to Col. 72. Parameters are separated from the code word and each other by commas.

Operator Comment (SPO)

The code word SPO signifies that a message should be sent to the B-5500 operator. The card format is:

$SPO, (operator message).

resulting in a typeout on the operator's console:

#EDIT/ATSC: (operator message)

The message should not exceed 59 characters and the card must contain both the comma, which denotes the beginning of the message, and the period which terminates it.

Specify Input Records (EDIT)

This card specifies a group of records to be processed on the present output tape. The statement can be in one of three forms. For example:

$EDIT,30

specifies processing of record 30

$EDIT,700,800

specifies processing of records 700 through 800

$EDIT,200,300,10

specifies processing of every 10th record from 200 through 300.

The group of records specified must not begin behind the present position of the input tape. After processing a group of lines specified by EDIT, the tape is positioned to do another record in the group. For example, after

$EDIT,7,8

the tape is positioned at record 9. After

$EDIT,700,800,5

the tape is at record 805.

WARNING : Record 1 must not be specified as a record to be edited.

Note: To find the number of the last record on a tape include the following card as the last card in the control card deck:

```
$EDIT,99999
```

The system in attempting to position the tape at record 99999 (which of course it won't find) will print out the number of the last record and then quit. However, if in trying to read and edit records, and the last record is reached, only a system diagnostic will appear.

The EDIT card actually causes processing of the lines specified.

### Rewind Input Tape (REWIND)

The REWIND statement causes the input tape to be rewound. It must be used if an EDIT REQUEST would otherwise point to records behind the present position of the input tape.

### Printer Output Options (DUMP)

The DUMP card has 1 integer parameter which sets printer output options for all records until changed by another dump card. The parameter is a key specifying the type of output wanted:

| | |
|---|---|
| 0 | no dumps or statistics |
| 1 | octal dump of output record |
| 2 | statistics on output elements |
| 3 | both statistics and octal dump |

OUTPUT : Octal dump printer output consists of 8-bit samples packed 6 per computer word.

Statistical output includes graphs of the distribution of samples and first differences, printout of the average and standard deviation of the samples, and a table giving the percentage of time that each bit position was turned on.

In addition to the optional dumps and statistical summaries, printer output always includes a listing of the control cards and comments as they occurr, and a line for each record processed, decoding the documentation from the beginning of the input record. The items appear in the following order:

1. Record Number
2. Sync Error On
3. Frame Identifier

4. Scan Direction
5. Green Video Gain - DB/2
6. Phase Lock Loop Error Count
7. Day
8. Hour
9. Fiducial Mark Status
10. Minutes
11. Gray Scale On
12. Seconds
13. Scan Mode
14. Spacecraft, Video Gain
15. Vertical Line Count
16. Record Color
17. Blue Video Gain - DB/2
18. Red Video Gain - DB/2

CONTROL CARD SUMMARY. TABLE I

| CODE WORD | FUNCTION | PARAMETERS |
|---|---|---|
| SPO | Operator Message | OPCOM |
| EDIT | Specify Input Records | 1-3 INTEGERS |
| REWIND | Rewind Input Tape | NONE |
| DUMP | Choose Printer Output Options for all Records | 1 INTEGER |

## SAMPLE RUN

```
?USER#25U717;EXECUTE ATSC/EDITOR;DATA DECK

$SPO,ASSIGN ATSC-15A AS INPUT TAPE (800 BPI).

$SPO,ASSIGN MY TAPE REGARDLESS OF PARITY.

$DUMP,3

$EDIT,501

$DUMP,0

$EDIT,520,870

$DUMP,3

$REWIND

$EDIT,499

$DUMP,0

$EDIT,500,869
```

SUBROUTINE: ATSIN

LANGUAGE : F-63/Compass

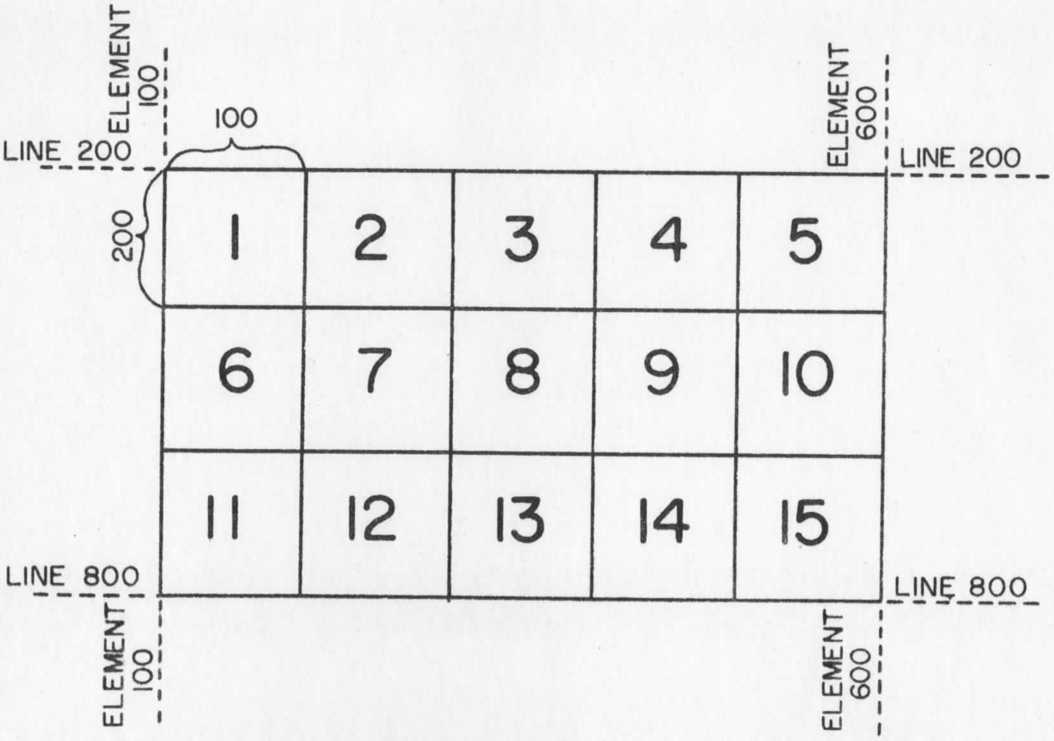
COMPUTER : 3600

PROGRAMMER: Eric A. Smith

DATE : June 12, 1967

PURPOSE : This is a general ATS input subroutine intended for those programs requiring the input of rectangular grids for analysis. The input tape required is an ATS tape (ATS-B cropped, ATS-C raw, ATS-C cropped) with six 8-bit picture elements packed to one 48-bit computer word. The subroutine unpacks the elements, transforms them if requested, and stores them in a linear array.

USAGE : There are 3 entry points to the subroutine of concern to the user. One involves the reading of a parameter card(s) and setting the necessary parameters in the second and third entries or main parts of the subroutine. The function of the routine is to input a matrix of uniform rectangular grids which themselves form a rectangle; each grid of the matrix being input on a separate call to the subroutine. The user must define the upper left hand corner of the matrix; the dimensions of the matrix; along with the dimensions of an individual matrix grid. A grid is simply an array of picture elements by scan lines which is to be analyzed by the calling program. The following example will illustrate its use.



A series of 100 by 200 size grids are to be input on separate calls to the subroutine. There are 15 such grids which form a 5 by 3 matrix of grids. The upper left hand corner of the matrix (complete rectangle) is located at line 200, element 100. The order in which each of the grids is input is shown by the numbering on the illustration, i. e., rowwise. To completely process the area, 15 separate calls must be made to the subroutine along with an initial call to set up the parameters.

The calling sequence for initial setting up of parameters is as follows:

```
CALL ATINSTUP(IDIM1,IDIM2,IDIM12, GRID)
```

IDIM1 = Column dimension of the individual grids.

IDIM2 = Row dimension of the individual grids.

IDIM12 = Product of IDIM1 and IDIM2 (this is used as the dimension for array GRID).

GRID = Array into which the grid is read, one picture element per word. Note that GRID is a linear array, the data being read in row-wise.

The following control card(s) is read by ATINSTUP. These include one main parameter card and enhancement cards (if requested).

Main Control Card

Col. 1-4: File number of data area; if left blank FN is set to 1.

Note: If FN is set negative, the documentation of the first line of each grid will be decoded and printed.

Col. 5-8: Top Scan Line of data area; if left blank TSL is set to 1.

Col. 9-12: Starting element (measured from left of picture file block); if left blank SE is set to 1.

Col. 13-16: Column dimension of grid matrix; if left blank CD is set to 1.

Col. 17-20: Row dimension of grid matrix; if left blank RD is set to 1.

Col. 21: 0 or blank if decimal dumps and frequency distribution plots are not desired.

1 if decimal dumps are desired.

2 if frequency distribution plots are desired.

3 if both decimal dumps and frequency distribution plots are desired.

Col. 22: 0 or blank if input grids are not read as binary decks.

1 if input grids are read as binary decks.

Note: If binary decks are read, a call to the main entry point is required however none of the other setup parameters are relevent. Since there is no tape movement involved with this option, the other parameters may be left blank; refer to the GET and PUT writeup on punched binary decks.

Col. 23: 0 or blank if punching out grids as binary decks is not desired.

1 if punching out grids as binary decks is desired.

Note: A request for binary punched grids will punch the complete matrix of grids in rowwise order; refer to the GET and PUT writeup on punched binary decks.

Col. 24: 0 or blank specifies normal element input.

1 specifies that after each element of an input line, the parameter specified in Col. 29-34 will be inserted N times, where N = the number specified in Col. 25-28; thus the grid columns are expanded. Note that the column dimension IDIM1 must specify that exact column dimension after the input line is expanded; the number of required elements read is calculated by dividing IDIM1 by the following parameter plus 1.

2 specifies that after each element of an input line, that particular element is repeated N times where N = the number specified in Col. 25-28. The same dimensioning rules as above apply to this case.

3 specifies that every N elements of an input line are averaged, where N = the number specified in Col. 25-28; thus the grid columns are contracted. Note that the column dimension IDIM1 must specify the exact column dimension after the input line is contrated; the number of required elements read is calculated by multiplying IDIM1 by the following parameter.

4 specifies that every Nth element of an input line is sampled, where N = the number specified in Col. 25-28. The dimensioning procedure is the same as in the case of element averaging.

Col. 25-28: This specification depends on which case is being used in Col. 24; this parameter must be 1 or greater if expansion or contraction has been requested; otherwise, leave blank.

Col. 29-34: If Col. 24 is 1, this parameter specifies the value to be inserted between elements; if Col. 24 is not 1, leave blank.

Col. 35: 0 or blank specifies normal line input.

1 specifies that after each grid row, rows containing the parameter specified in Col. 40-45 will be inserted N times, where N = the number specified in Col. 36-39; thus the grid rows are expanded. Note that the row dimension IDIM2 must specify the exact row dimension _after_ the grid rows are expanded; the number of required input lines is calculated by _dividing_ IDIM2 by the following parameter plus 1.

2 specifies that after each grid row, that particular row is repeated N times where N = the number specified in Col. 36-39. The same dimensioning rules as above apply to this case.

3 specifies that every N grid rows are averaged (by columns), where N = the number specified in Col. 36-39; thus the grid rows are contracted. Note that the row dimension IDIM2 must specify the exact row dimension after the grid rows are contracted; the number of required input lines is calculated by multiplying IDIM2 by the following parameter.

4 specifies that every Nth grid row is sampled, where N = the number specified in Col. 36-39. The dimensioning procedure is the smae as in the case of line averaging.

Col. 36-39: This specification depends on which case is being used in Col. 35; this parameter must be 1 or greater if expansion or contraction has been requested; otherwise, leave blank.

Col. 40-45: If Col. 35 is 1, this parameter specifies the value to be used in inserted grid rows; if Col. 35 is not 1, leave blank.

Col. 46: 0 or blank specifies no enhancement.

1 specifies that enhancement is desired; if so the user must prepare input cards containing the values to be replaced for the succesive brightnesses 0, 1, 2, ..., 255 (all 256 values). These values are punched 26 to a card in 3 column fields thereby requiring the use of 10 cards. The data values are enhanced before any expansion or contraction.

Col. 47: 0 or blank specifies that no log transformation is desired.

1 specifies that the data values undergo the natural log transformation; this will be done after any enhancement and any expansion or contraction. A data dump or frequency distribution request will be done prior to the log conversion.

After this card(s) is read the input parameters are echoed, and the tape is positioned at the starting line of the number one grid while parameters from the main entries are established. The subroutine must now be called through a main entry the exact number of times that there are grids in the matrix. The user may analyze or ignore the individual grids, but in order to properly reference the next data block all calls must be completed. The incoming grids as stated are sequenced row-wise.

The main entries use the following calling sequence:

```
CALL IATSIN(IDIM1,IDIM2,IDIM12,GRID)
                    or
CALL FATSIN(IDIM1,IDIM2,IDIM12,GRID)
```

The formal parameters are the same as those used for ATINSTUP. IATSIN returns the grid in integer mode; FATSIN returns the grid in floating point mode. The mode of GRID in the calling program must correspond to the mode request.

Note: The log transformation request cannot be used if integer mode is requested.

The user should note that in processing a series of data blocks, the sequence of files accessed must be in ascending order. This order need not be used for starting lines within files but it is strongly advised for time-cost purposes.

The input tape must be assigned to LUN 1. Subroutines .IOPACK., PUT,BDECODE, and CDECODE must be used with this subroutine.

If the calling program requires values of the input parameters, the calling program must contain a COMMON /S/ IATSIN1,IATSIN2,IATSIN3, IATSIN4,IATSIN5,IATSIN6,IATSIN7,IATSIN8,IATSIN9,IATSIN10,IATSIN11, IATSIN12,IATSIN13,IATSIN14,IATSIN15,IATSIN16 declaration. The list variables are the addresses of the parameter list given under the Main Control Card heading.

Note on Storage Allocation

The user must take precaution when element sampling or averaging or line averaging. The space required in array GRID, in these cases, is not indicated by IDIM12. If, for example, the user were reading in a grid, which had final dimensions of 100 elements by 100 lines, but was averaging every 3 elements and every 5 lines, 10,000 words would not be enough core storage to handle the operation. This is because the program handles the data in the following manner:

1. Read first line of 300 elements for Line 1 of grid and store starting at location 1 and ending at location 300 of GRID.

2. Average every 3 elements of first line, contracting to 100 elements, and store starting at location 1 and ending at location 100 of GRID.

3. Read second line of 300 elements for Line 1 of grid and store starting at location 101 and ending at location 400 of GRID.

4. Average every 3 elements of second line, contracting to 100 elements and store starting at location 101 and ending at location 200 of GRID.

5. Continue in the same manner for third, fourth, and fifth lines of Line 1, resulting in the first 500 locations of GRID being used.

6. Average 5 lines (down columns), yielding Line 1 (100 elements) and store starting at location 1 and ending at location 100 of GRID.

7. This process continues until the last line is created (below).

8. Read first line of 300 elements for Line 100 of grid and store starting at location 9,901 and ending at location 10,200 of GRID.

9. Average every 3 elements of first line, contracting to 100 elements, and store starting at location 9,901 and ending at location 10,000 of GRID.

10. Continue for second, third, and fourth lines on Line 100.

11. Read fifth line of 300 elements for Line 100 and store starting at location 10,301 and ending at location 10,600 of GRID.

12. Average every 3 elements of fifth line, contracting to 100 elements, and store starting at location 10,301 and ending at location 10,400 of GRID.

13. Average 5 lines (down columns) and store starting at location 9,901 and ending at location 10,000 of GRID.

The above example should indicate how much extra core is required. Note that element sampling is handled in the same fashion as element averaging. Line sampling does not require the extra lines to be read.

The following formula can be used to compute the extra cores required.

$$K = (M-1) \cdot IDIM2 + (N-1) \cdot IDIM1$$

where

K = no. of extra cores required

M = no. of lines averaged (only use if $M > 1$)

N = no. of elements averaged; or sampling unit (only use if $N > 1$)

SUBROUTINE: CLINE

LANGUAGE : F-63/Compass

COMPUTER : 3600

PROGRAMMER: Eric Smith

DATE :

PURPOSE : The construct of this program is presently under development.

August 18, 1967

PROGRAM : .IOPACK.

PROGRAMMER : John Benson

LANGUAGE : COMPASS

PURPOSE : 3600 Tape Handling

DESCRIPTION : Some of the entry points to .IOPACK. modify Fortran usage, while others expand the class of operations available to the central program. When a call is used to one of these entry points (except for Q8QIFUNI) the system hangs until the unit is quiet. Then an IO request is initiated and control is returned to the calling program. Errors may be checked for, but if they are not, they are ignored. A thorough knowledge of the tape contents is necessary to make use of .IOPACK. No standard references (READ, WRITE) should be attempted on a unit after a call to any of these entry points.

DESCRIPTION OF ENTRY POINTS:

LUNCHMMM
MUNCHMMM

These are dummy entry points necessitated by program logic. They are of no use to you or to anybody else.

BFO.

Called implicitly by a fortran BUFFER OUT statement, it is probably equivalent to the systems version.

BFI.

Called implicitly by a fortran BUFFER IN, this routine does not perform retries after parity errors: if retries are desired, they must be written into the logic of the main program. One word records other than file marks can not be read.

Q8QIFUNI

Called implicitly by the fortran IF UNIT statement, this routine gives information about the status of a logical unit. A 4-branch or 3-branch IF UNIT statement is useful only after BUFFER IN or READPART. Note that the 4th branch now only indicates the existence of a parity error and not its intransigence.

READPART (N,M,A,I,K)

Skips N words of a record and reads M words into array A from unit I in parity K. N may be zero but must not be negative. If N + 1 is greater than the length of the present record on unit I, reading will start at the beginning of the next record. Therefore, READPART should not be used when the programmer is uncertain of the contents of the tape. The operation will be terminated by a file mark anywhere, or by end of record after the beginning of the read phase.

```
SKIPREC  (N,I)
BACKREC  (N,I)
SKIPFIL  (N,I)
BACKFIL  (N,I)
```

Performs the indicated action N times on unit I. No check is made for file marks in SKIPREC or BACKREC.

LENGTHF(I)

Will return the number of words buffered in on the last operation on unit I if and only if

1) The last operation on Unit I was a Buffer In

2) Unit I is the last unit for which there was a Buffer In request.

Essentially, I is a dummy and a call to LENGTHF will return the length of the last record input, regardless of I. However this parameter <u>must</u> be present.

PROGRAM : B5ATSIO

PROGRAMMER : John Benson

LANGUAGE : Compass

PURPOSE : 3600 Tape Handling

DESCRIPTION: This package is used in the same manner as .IOPACK., however it is limited to a restricted number of B5500 generated ATS-B cropped tapes. These tapes are formated such that a normal 1200 word record, is split into two 600 word records. A special version of ATSIN and this IO package are required to handle these tapes.

The following tapes require the use of B5ATSIO

1. CROPB-18
2. CROPB-22
3. CROPB-25

PROGRAM : PUT

LANGUAGE : FTN/Compass

COMPUTER : 3600

PROGRAMMER : John Benson

PURPOSE : Binary Card Input/Output

USAGE : CALL PUT(A,N)
will output N computer words starting from location A onto binary cards; 19 words per card. Each card is sequenced and check-summed. Last card output is a SCOPE end-of-file card.

CALL GET (A, N)

inputs cards previously produced by PUT. Last card read by each call to GET must be a SCOPE end-of-file card.

**Note: .IOPACK. must be used in conjuction with this subroutine.**

PROGRAM : USEATSIN

LANGUAGE : F-63

COMPUTER : 3600

PROGRAMMER : Eric A. Smith

DATE : February 13, 1968

PURPOSE : This is a program which sequences a specified number of calls to ATSIN to utilize any of its options. Either the integer or floating point version of ATSIN may be used.

USAGE : Control Card

Col. 1-4: Column dimension of GRID (IDIM1).

Col. 5-8: Row dimension of GRID (IDIM2).

Col. 9: I if integer version is desired.

F if floating point version is desired.

Limitation: IDIM1 x IDIM2 cannot exceed 32,000.

ATSIN Control Card(s)

ATSIN parameter card(s) (See ATSIN write up)

This sequence of cards may be repeated as often as desired, however, the final case must be followed by a blank card.

After reading the first control card, the program calls ATINSTUP which reads the ATSIN parameter card(s). The program then sequences the specified number of calls to ATSIN (this number is specified by the product of matrix grid column dimension and the matrix grid row dimension read in on the ATSIN main parameter card).

## SUMMARY OF CARD ORDER

1. $\substack{7\\9}$JOB,0025,0717/SMITH,10

2. $\substack{7\\9}$PRINTALL

3. $\substack{7\\9}$DEMAND 16000

4. Any EQUIP, TAPE, and REMARK Cards

5. $\substack{11\\5\\7\\9}$BANK,(1),/1/

6. $\substack{11\\5\\7\\9}$BANK,(0),ALL.

7. RBD of USEATSIN

8. RBD of .IOPACK.

9. RBD of ATSIN

10. RBD of PUT

11. RBD of BDECODE

12. RBD of CDECODE

13. $\substack{7\\9}$RUN, 10, 99999,1,,,99999

14. Main Parameter Card

15. ATSIN Main Parameter Card (and Enhancement Cards if necessary)

    *****

16. Repeat steps 14-15 as often as necessary

    *****

17. Blank Card

PROGRAM : ATSPLOT

LANGUAGE : F-63

COMPUTER : 3600

PROGRAMMER : Eric A. Smith

DATE : February 20, 1968

PURPOSE : This program plots ATS records on the calcomp plotter. The data are read by ATSIN and may be transformed by the use of its various transformation parameters. This program handles both east-west and north-south scans.

USAGE : The program is set up to process a series of ATS grids under one set of parameters with the provision of reinitiating for the second series and so on. After a grid is read, either the individual rows or individual columns are plotted separately, depending on which type of scan is desired (east-west or north-south). If either of the grid dimensions is not specified, the program assumes the user is plotting individual lines (east-west) or individual columns (north-south) and sets the unspecified dimension to 1. Note that ATSIN considers a single line as a grid with a row dimension of 1. The following parameters are required on a control card.

First Control Card

Col. 1-4: Number of columns of the input grids. If this dimension is not specified, it will be set to 1.

Col. 5-8: Number of rows of the input grids. If this dimension is not specified, it will be set to 1.

Limitations: NC X NR cannot exceed 32000.

Col. 9: 0 or blank if east-west scans are desired.

1 if north-south scans are desired.

Col. 10: This parameter is a plot length factor. The normal plot length is computed by PL = DIM/100 (inches) where DIM is the column dimension if east-west scans are desired or DIM is the row dimension if north-south scans are desired. This setting results in each point of the plot being spaced by the minimum increment of the plotter. By setting this parameter to N, the total plot length will equal PL X N. If this parameter is not specified it will be set to 1.

Col. 11-13: This parameter is a Y axis scale factor. By setting this parameter to M, the ordinate scale runs from 0 to 250/M. If this parameter is not specified it will be set to 1.

Col. 14-15: Plotter tape LUN (2≤ LUN≤49; if LUN is left blank or out of range, it will be set to 62, i.e., the Scope System plotter unit).

## ATSIN Control Card(s)

ATSIN parameter card(s) (See ATSIN write up)

After these parameters are read, a series of input grids may be processed. Preceeding each call to ATSIN, an 80 column alphanumeric title card is read. This information is used as a title for the plots associated with the grid. If new parameters are desired, a card with the word END in the first 3 columns follows the first group of title cards. This procedure may continue with no limitations, however the final group must be followed by a card with the word FINISH in the first 6 columns. This indicates the run is complete.

Note on the use of binary decks: If the user is reading binary decks produced by ATSIN, parameters 3, 9, 10, 12, and 13 must be present on the ATSIN control card along with parameter 7 which requests binary deck input.

## SUMMARY OF CARD ORDER

1. $\substack{7\\9}$JOB,0025,0717/SMITH,10

2. $\substack{7\\9}$PRINTALL

3. $\substack{7\\9}$DEMAND,16000

4. Any EQUIP, TAPE, and REMARK Cards

5. $\substack{11\\5\\9}$BANK,(1),/1/

6. $\substack{11\\5\\9}$BANK,(0),ALL.

7. RBD of ATSPLOT

8. RBD of ATSIN

9. RBD of .IOPACK.

10. RBD of PUT

11. RBD of BDECODE

12. RBD of CDECODE

13. $\substack{7\\9}$RUN,10,99999,1,,,99999,999

14. Main Parameter Card

15. ATSIN Main Parameter Card (and Enhancement Cards if necessary)

16. Set of Title Cards (1 Title Card for each Grid of the Grid Matrix
    as specified by Parameters 4 and 5 of the
    ATSIN Main Parameter Card)

17. END Card if steps 14-16 are to be repeated
    FINISH Card if run is over

PROGRAM : ATSFETUR

LANGUAGE : F-63

COMPUTER : 3600

PROGRAMMER : Eric A. Smith

DATE : August 31, 1967

PURPOSE : This program analyzes user selected regions of an ATS signal. A region for our purposes is defined as an intervel of the scan line where the slope of a linear least squares fit through the region is less than the "critical slope". The "critical slope" is a function of 4 variables. The user has control over the "critical slope" as these variables are program parameters. The program divides the line into regions satisfying the specified conditions and these regions have their means, variances, and standard deviations computed. By the use of another parameter, regions falling below a minimum region size are ignored. A last parameter determines a uniform section size that the regions are further broken down into. When this occurs, the individual sections have their statistics computed. The information is output as a table consisting of 3 different measures; those areas of the signal not within the regions are referred to as boundries; rejected regions are referred to as holes; regions or sections of regions are referred to as clouds. As the line is scanned from left to right, this information is progressivly recorded along with an element count for each measure. The accepted regions are numbered and within each region the individual sections are numbered.

The records are read by ATSIN and may be transformed by the use of ATSIN subroutine parameters. This program handles both east-west and north-south scans.

USAGE : The program is set up to process a series of ATS grids under one set of parameters with the provision of reinitiating for the second series and so on. After a grid is read, either the individual rows or individual columns are plotted separately, depending on which type of scan is desired (east-west or north-south). If either of the grid dimensions is not specified, the program assumes the user is analyzing individual lines (east-west) or individual columns (north-south) and sets the unspecified dimension to 1. Note that ATSIN considers a single line as a grid with a row dimension of 1. The following parameters are required on a control card.

First Control Card

Col. 1-4: Number of columns of the input grids. If this dimension is not specified, it will be set to 1; this dimension cannot exceed 8000.

Col. 5-8: Number of rows of the input grids. If this dimension is not specified, it will be set to 1; this dimension cannot exceed 8000.

Limitations: NC X NR cannot exceed 24000.

Col. 9: 0 or blank if east-west scans are desired.

1 if north-south scans are desired.

Col. 10-13: Number of samples averaged.

Col. 14-17: Number of samples skipped.

Col. 18-21: Boundry determinator difference.

Col. 22-25: Consecutive differences needed.

Col. 26-29: Minimum sample section.

Col. 30-33: Maximum sample section.

ATSIN Control Card (s)

ATSIN parameter card(s) (See ATSIN write up)

After these parameters are read, a series of input grids may be processed. Preceeding each call to ATSIN, an 80 column alphanumeric title card is read. The information is used as a title for the tables associated with the grid. If new parameters are desired, a card with the word END in the first 3 columns follows the first group of title cards. This procedure may continue with no limitations, however, the final group must be followed by a card with the word FINISH in the first 6 columns. This indicates the run is complete.

## SUMMARY OF CARD ORDER

1. $\substack{7\\9}$JOB,0025,0717/SMITH,10
2. $\substack{7\\9}$PRINTALL
3. $\substack{7\\9}$DEMAND,16000
4. Any EQUIP, TAPE, and REMARK Cards
5. $\substack{11\\9\\7}$BANK, (1), /1/
6. $\substack{11\\9\\7\\7}$BANK, (0), ALL.
7. RBD of ATSFETUR
8. RBD of ATSIN
9. RBD of .IOPACK.
10. RBD of PUT
11. RBD of BDECODE
12. RBD of CDECODE
13. $\substack{7\\9}$RUN,10,99999,1,,,99999
14. Main Parameter Card
15. ATSIN Main Parameter Card (and Enhancement Cards if necessary)
16. Set of Title Cards (1 Title Card for each Grid of the Grid Matrix
    as specified by Parameters 4 and 5 of the
    ATSIN Main Parameter Card)
17. END Card if steps 14-16 are to be repeated

    FINISH Card if run is over

Col. 15-16: Specifies how many spacing will be between print lines; if Col. 14 is 0 or blank, blank spacing is used; if Col. 14 is 1, the line is repeated; leave blank if no extra spacing is desired.

Col. 17-18: Number of extra copies of maps desired; leave blank if no extra copies desired.

Col. 19-20: Specifies logical tape unit onto which maps are printed (2≤ LUN≤49; if left blank or out of range LUN is assigned to 61, i.e., the standard output unit).

ATSIN Control Card (s)

ATSIN parameter card(s) (See ATSIN write up)

After these parameters are read, a series of input grids may be processed. Preceeding each call to ATSIN, an 80 column alphanumeric title card is read. This information is used as a title for the numeric display associated with the grid. If new parameters are desired, a card with the word END in the first 3 columns follows the first group of title cards. This procedure may continue with no limitations, however, the final group must be followed by a card with the word FINISH in the first 6 columns. This indicates the run is complete.

The output will be produced in a series of strips with each strip a maximum of 135 columns. Each strip will include all rows of an input grid.

## SUMMARY OF CARD ORDER

1. $\substack{7\\9}$JOB,0025,0717/SMITH,10

2. $\substack{7\\9}$PRINTALL

3. $\substack{7\\9}$DEMAND,16000

4. Any EQUIP, TAPE, and REMARK Cards

5. $\substack{11\\0\\7\\9}$BANK, (1), /1/

6. $\substack{11\\0\\7\\9}$BANK, (0), All.

7. RBD of ATSPOST

8. RBD of ATSIN

9. RBD of .IOPACK.

10. RBD of PUT

11. RBD of BDECODE

12. RBD of CDECODE

13. $\substack{7\\9}$RUN,10,99999,1,,,99999

14. Main Parameter Card

15. ATSIN,Main Parameter Card (andEnhancement Cards if necessary)

16. Set of Title Cards (1 Title Card for each Grid of the Grid Matrix
as specified by Parameters 4 and 5 of the ATSIN
Main Parameter Card)

17. END Card if steps 14-16 are to be repeated
FINISH Card if run is over

PROGRAM : ATSDSPLY

LANGUAGE : F-63/Compass

COMPUTER : 3600

PROGRAMMER: Eric A. Smith

DATE : June 6, 1967

PURPOSE : This program is an ATS character display program designed to allow the user to specify a printer character to a range of values over elements of a grid and then outputting the grid, in character form, on a line.printer. This program allows for overprinting characters.

USAGE : This program is set up to process a series of ATS grids under one set of parameters with the provision of reinitiating for the second series and so on. The following parameters are required on control cards.

First Control Card

Col. 1-3: Number of columns of the input grids.

Col. 4-6: Number of rows of the input grids.

Limitations: $(((NC-1)/8 + 1) \times NR) \times K$ cannot exceed 4000, where K = number of overprint sets + 1; $NC \times NR$ cannot exceed 32000.

Col. 7-9: The number of intervals to which characters are to be assigned $(2 \leq NI \leq 64)$.

Col. 10: 0 or blank specifies that the BCD characters to be used will themselves be read on the following card in a 64R1 format. They should be punched in order as to their assignment to an ascending set of intervals.

1 specifies that the octal codes (internal) of the BCD characters to be used will be read on the following card(s) in a 4002 format. This feature enables the user to have access to the complete set of printer characters, otherwise unavailable on the keypunch. The codes should be punched in order as to their assignment to an ascending set of intervals.

Col. 11: 0 or blank specifies that the size of the intervals over the range of values is uniform (see below).

1 specifies that the size of the intervals over the range of values is non-uniform (requires the third control card).

Col. 12-21: If Column 11 contains a 0 or blank, this parameter specifies a floating point number which is the upper bound of the first interval (F10.4, if the decimal is not punched).

Col. 22-31: If Column 11 contains a 0 or blank, this parameter specifies a floating point number which is the size of the uniform intervals (F10.4, if the decimal is not punched). Note that the first and the last intervals are not necessarily equivalent to the specified interval size. This is because the interval bounds are computed by a recursive adding of the interval size to the initial upper bound, and ending with the computation of the upper bound of the next to the last interval. Since the first interval has no lower bound specified, and the last interval has no upper bound computed, these two intervals are, in a sense, open ended.

Col. 32: 0 or blank specifies that line repetition is not used.

1 specifies that line repetition is used.

Col. 33-34: Specifies how many spacings will be between print lines; if Col. 32 is 0 or blank, blank spacing is used; if Col. 32 is 1, the line is repeated; leave blank if no extra spacing is desired.

Col. 35-36: Number of extra copies of maps desired, leave blank if no extra copies desired.

Col. 37-38: Specifies logical tape unit onto which maps are printed (2 ≤ LUN ≤ 49; if left blank or out of range LUN is assigned to 61, i.e. the standard output unit).

Col. 39: Number of overprint sets desired (0 ≤ OCS ≤ 9).

## Second Control Card

These cards contain either the BCD characters or the octal codes of the BCD characters to be assigned to the intervals. Parameter 4 of the previous card specifies which type is read. Parameter 3 of the previous card specifies the total number of characters or codes read. The main character set and all overprint characters sets must be included.

Note: If a single character is desired in a specific position, the overprint characters corresponding to that position must be blank.

Third Control Card (Optional)

If Column 11 of the first control card contains a 1 punch, this card contains the n-1 (may not exceed 63) upper bounds for the n specified intervals (see explanation of uniform intervals). This card allows non-uniform intervals to be chosen. This card uses a 8F10.4 format (use extra cards, if necessary).

ATSIN Control Card (s)

ATSIN parameter card(s) (See ATSIN write up)

After these parameters are read, a series of input grids may be processed. Preceeding each call to ATSIN, an 80 column alphanumeric title card is read. This information is used as a title for the map associated with the grid. If new parameters are desired, a card with the word END in the first 3 columns follows the first group of title cards. This procedure may continue with no limitations, however, the final group must be followed by a card with the word FINISH in the first 6 columns. This indicates the run is complete.

The output will be produced in a series of strips with each strip a maximum of 128 columns. Each strip will include all rows of an input grid.

WARNING : A large number of overprints per line tends to punch holes in the printer paper. One or two overprint character sets should usually be sufficient for a complete range of gray scales (if required at all).

## SUMMARY OF CARD ORDER

1. $\substack{7\\9}$JOB,0025,0717/SMITH,10

2. $\substack{7\\9}$PRINTALL

3. $\substack{7\\9}$DEMAND,16000

4. Any EQUIP, TAPE, and REMARK Cards

5. $\substack{11\\0\\7\\9}$BANK, (1), /B1/

6. $\substack{11\\0\\7\\9}$BANK, (0), ALL.

7. RBD of ATSDSPLY

8. RBD of ATSIN

9. RBD of .IOPACK.

10. RBD of PUT

11. RBD of BDECODE

12. RBD of CDECODE

13. $\substack{7\\9}$RUN,10,99999,1,,,99999

14. Main Parameter Card

15. Main Character Set Card(s)

    First Overprint Character Set Card(s)-if needed

    Second Overprint Character Set Card(s)-if needed

    *****

    Include all overprint sets

    *****

16. Non-uniform Intervals Card(s)-if needed

17. ATSIN Main Parameter Card (and Enhancement Cards if necessary)

18. Set of Title Cards (1 Title Card for each Grid of the Grid Matrix as specified by Parameters 4 and 5 of the ATSIN Main Parameter Card)

19. END Card if steps 14-18 are to be repeated

    FINISH Card if run is over

PROGRAM : ATSCNTUR

LANGUAGE : F-63/Compass

COMPUTER : 3600

PROGRAMMER : Eric A. Smith

DATE : July 21, 1967

PURPOSE : This program is a ATS contouring program designed to allow the user to specify the horizontal and vertical projection, and the contour levels. The contour map is outputted on the calcomp plotter with the individual contour lines labeled if requested.

The grids are read by ATSIN and may be transformed by the use of ATSIN subroutine parameters.

USAGE : This program is set up to process a series of ATS grids under one set of parameters with the provision of reinitiating for the second series and so on. The following parameters are required on control cards.

<u>First Control Card</u>

Col. 1-3: Number of columns ($2 \leq NC \leq 200$).

Col. 4-6: Number of rows ($2 \leq NR \leq 200$).

Limitations: NC X NR cannot exceed 16,000.

Col. 7-12: Width of contour map (F6.2 format; this is the X distance on the plotter; $0 < P1 \leq 150.00$); if this parameter is blank or out of limits, it will be set to 10.0.

Col. 13-18: Height of contour map (F6.2 format; this is the Y distance on the plotter; $0 < P2 \leq 30.0$); if this parameter is blank or out of limits, it will be set to 10.0.

Col. 19-20: Number of contour levels ($1 \leq NCL \leq 48$); if this parameter is blank or out of limits, it will be set to 5.

Col. 21: 0 or blank specifies that uniform contour levels will be used requiring the specification of the following two parameters.

1 specifies that non-uniform contour levels will be used, requiring the reading of (a) contour levels card(s).

2 specifies that the program will set up the desired number of contour levels with their values based on the maximum and minimum values in the grid.

Col. 22-31: If Col. 21 is 0 or blank, this parameter specifies the minimum contour level; otherwise leave blank (use a F10.4 format).

Col. 32-41: If Col. 21 is 0 or blank, this parameter specifies the uniform spacing between the contour levels; otherwise leave blank (use a F10.4 format).

Col. 42: 0 or blank specifies that the horizontal grid spacing (spacing between columns) is uniform and will be calculated from the grid column dimension and the contour map width.

1 specifies that the horizontal grid spacing is non-uniform and will be read in on (a) horizontal grid spacing cards (s).

Col. 43: 0 or blank specifies that the vertical grid spacing (spacing between rows) is uniform and will be calculated from the grid row dimension and contour map height.

1 specifies that the vertical grid spacing is non-uniform and will be read in on (a) vertical grid spacing card (s).

Col. 44: 0 or blank specifies that contour line labeling (contour value) will be used requiring the specification of the following two parameters.

1 specifies that labeling will not be used.

Col. 45-50: Desired size (height) of contour labels (use a F6.4 format; $0 < H \leq 1.0$, if this parameter is blank or out of limitis it will be set to 0.14.

Col. 51-56: 4-6 character floating point format field of the form Fxx.yy specifying the format of the contour line labels (which are the contour levels themselves); e.g., if the contour levels range from 0.25 to 0.75 the format must read F4.2. This field must not be left blank if labeling is desired; this parameter must be left justified.

Col. 57: 0 or blank if contour smoothing is desired.

1 if contour smoothing is not desired.

Col. 58-59: Plotter tape logical unit number; if 2 ≤ LUN ≤ 49 the user must supply his own tape; if this value is out of range or left blank it will take on the value 62, i.e., the Scope system unit for plotter tape.

Contour level card (use only if Col. 21 is 1)

This (these) card(s) contain(s) in an 8F10.4 format the desired contour levels (Col. 19-20) in ascending order.

Horizontal grid spacing card (use only if Col. 42 is 1)

This (these) card(s) contain(s) in an 8F10.4 format the desired spacing between columns starting from the left of the map. Note that the first spacing is measured between the map border and the first column and the last spacing is measured between the final two columns, thus yielding the same number of spacings as there are columns.

Vertical grid spacing (use only if Col. 42 is 1)

This (these)card(s) contain (s) in an 8F10.4 format the desired spacings between rows starting from the bottom of the map. Note that the first spacing is measured between the map border and the bottom row and the last spacing is measured between the two topmost rows, thus yielding the same number of spacings as there are rows.

ATSIN Control Card (s)

ATSIN parameter card(s) (See ATSIN write up)

After these parameters are read, a series of input grids may be processed. Preceeding each call to ATSIN, an 80 column alphanumeric title card is read. This information is used as a title for the plot associated with the grid. If new parameters are desired, a card with the word END in the first 3 columns follows the first group of title cards. This procedure may continue with no limitations, however, the final group must be followed by a card with the word FINISH in the first 6 columns. This indicates the run is complete.

## SUMMARY OF CARD ORDER

1. $\substack{7\\9}$JOB,0025,0717/SMITH,10
2. $\substack{7\\9}$PRINTALL
3. $\substack{7\\9}$DEMAND,16002
4. Any EQUIP, TAPE, and REMARK Cards
5. $\substack{11\\0\\7\\9}$BANK, (0), /1/
6. $\substack{11\\0\\7\\9}$BANK, (1), ALL.
7. RBD of ATSCNTUR
8. RBD of ATSIN
9. RBD of .IOPACK.
10. RBD of PUT
11. RBD of BDECODE
12. RBD of CDECODE
13. $\substack{7\\9}$RUN,10,99999,1,,,99999,999
14. Main Parameter Card
15. Non-uniform Contour Levels Card(s)-if needed
16. Non-uniform Horizontal Grid Spacings Card(s)-if needed
17. Non-uniform Vertical Grid Spacings Card(s)-if needed
18. ATSIN Main Parameter Card (and Enhancement Cards if necessary)
19. Set of Title Cards (1 Title Card for each Grid of the Grid Matrix as specified by Parameters 4 and 5 of the ATSIN Main Parameter Card)
20. END Card if steps 14-19 are to be repeated

    FINISH Card if run is over

PROGRAM : CLOUDPOP

LANGUAGE : F-63

COMPUTER : 3600

PROGRAMMER : Eric A. Smith

DATE : August 25, 1967

PURPOSE : This is an "ATS picture" cloud consensus and statistics program. The information computed consists of the following; a map of cloud boundaries based on upper and lower thresholds; an information table associated with the individual clouds on the map; frequency distributions for cloud size, cloud mean brightness, and picture element brightness; the percent of total cloud cover; and the mean picture brightness. The cloud map is output on the calcomp plotter and consists of the individual cloud borders and an index number which can be looked up in the information table. There are two indexing systems. The first is for clouds that are seven or less elements in size. These clouds are numbered consecutively in the order that they are found by scaning the picture grid. These clouds will be listed at the front of the information table. All clouds of larger size are indexed with the second system which again numbers them consecutively but follow each number with an asterick. These clouds will be listed in the latter portion of the table. The information table consists of five "cloud characteristics" headings; cloud size (measured in elements); cloud percent of picture (by size); cloud mean brightness; cloud brightness; cloud brightness center; and cloud geometric center. The other information is optional and when requested will be both printed and plotted.

USAGE : This program is set up to process a series of ATS grids under one set of parameters with the provision of reinitiating for the second series and so on. The following parameters are required on control cards.

First Control Card

Col. 1-3: Number of columns (NC cannot be less than 2).

Col. 4-6: Number of rows (NR cannot be less than 2).

Limitation: NC X NR cannot exceed 32,000.

Col. 7-12: Width of cloud map (F6.2 format; this is the X distance on the plotter; $0 < P1 \leq 150.0$); if this parameter is blank or out of limits, it will be set to 10.0.

Col. 13-18: Height of cloud map (F6.2 format; this is the Y distance on the plotter; $0 < P2 \leq 30.0$); if this parameter is blank or out of limits, it will be set to 10.0.

Col. 19: 0 or blank if information tables are not to be punched.

1 if information tables with headings are to be punched.

Col. 20: 0 or blank specifies that the cloud size intervals are uniform; this method requires the following three parameters.

1 specifies that the cloud size intervals are non-uniform; this method requires the following parameter and (a) cloud size intervals card(s).

2 specifies that a cloud size frequency distribution will not be calculated.

Col. 21-23: Specifies the number of cloud size intervals ($2 \leq N \leq 256$); leave blank if Col. 20 is 2.

Col. 24-29: If Column 20 is 0 or blank this parameter specifies a fixed point number which is the upper bound of the first interval (use an 16 format).

Col. 30-35: If Column 20 is 0 or blank this parameter specifies a fixed point number which is the size of the uniform intervals (use an 16 format). Note that the first and last intervals are not necessarily equivalent to the specified interval size. This is because the interval bounds are computed by a recursive adding of the interval size to the initial upper bound, and ending with the computation of the upper bound of the next to the last interval. Since the first interval has no lower bound specified, and the last interval has no upper bound computed, these two intervals are, in a sense, open ended.

Col. 36: 0 or blank specifies that the element brightness intervals are uniform; this method requires the following three parameters.

1 specifies that the element brightness intervals are non-uniform; this method requires the following parameter and (a) element brightness intervals control cards(s).

2 specifies that an element brightness frequency distribution will not be calculated.

Col. 37-39: Specifies the number of element brightness intervals ($2 \leq N \leq 256$); leave blank if Col. 36 is 2.

Col. 40-45: If Column 36 is 0 or blank this parameter specifies a floating point number which is the upper bound of the first interval (use an F6.2 format).

Col. 46-51: If Column 36 is 0 or blank this parameter specifies a floating point number which is the size of the uniform intervals (use an F6.2 format). See explanation under parameter in Col. 30-35.

Col. 52: 0 or blank specifies that the cloud mean brightness intervals are uniform; this method requires the following three parameters.

1 specifies that the cloud mean brightness intervals are non-uniform; this method requires the following parameter and (2) cloud mean brightness intervals control card(s).

2 specifies that a cloud mean brightness frequency distribution will not be calculated.

Col. 53-55: Specifies the number of cloud mean brightness intervals ($2 \leq N \leq 256$); leave blank if Col. 52 is 2.

Col. 56-61: If Col. 52 is 0 or blank this parameter specifies a floating point number which is the upper bound of the first interval (use an F6.2 format).

Col. 62-67: If Col. 52 is 0 or blank this parameter specifies a floating point number which is the size of the uniform intervals (use an F6.2 format). See explanation for parameter in Col. 30-35.

Col. 68: Specifies the number of cloud threhold cases desired. Each case will provide separate output. The upper and lower cloud-brightness threshold values are read on the following card. If only 1 case is desired, this column may be left blank. The program allows a maximum of 6 cases.

Col. 69-70: Specifies logical tape unit onto which maps are plotted ($3 \leq \text{LUN} \leq 49$; if left blank or out of range, LUN is assigned to 62, i.e. the standard plotter unit).

### Second Control Card

This card contains the pairs of cloud-brightness threshold values.

For each set (as requested in Col. 68 of the first control card), a lower threshold followed by a upper threshold are punched in a 6(2F6.2) format. A maximum of 6 cases are allowed.

Conditions: If $LCT < 0$ or $LCT > 256$, then $LCT = 25$.

If $UCT > 256$, then $UCT = 256$.

If $LCT > UCT$, then $UCT = 256$.

LCT = Any lower cloud threshold.

UCT = Any upper cloud threshold.

### Third Control Card (Optional):

If column 20 of the first control card contains a 1 punch, this card contains the n-1 upper bounds for the n specified intervals (see explanation of uniform intervals). This card allows non-uniform cloud size intervals to be chosen (use an 8I10 format; use extra cards if necessary).

### Fourth Control Card (Optional):

If column 36 of the first control card contains a 1 punch, this card contains the n-1 upper bounds for the n specified intervals (see explanation of uniform intervals). This card allows non-uniform element brightness intervals to be chosen (use an 8F10.4 format; use extra cards if necessary).

### Fifth Control Card (Optional):

If column 52 of the first control card contains a 1 punch, this card contains the n-1 upper bounds for the n specified intervals (see explanation of uniform intervals). This card allows non-uniform cloud mean brightness intervals to be chosen (use an 8F10.4 format; use extra cards if necessary).

### ATSIN Control Card (s)

ATSIN parameter card(s) (See ATSIN write up)

After these parameters are read, a series of input grids may be processed. Preceeding each call to ATSIN, an 80 column alphanumeric title card is read. This information is used as a title for the plot and tables associated with a grid. If new parameters are desired, a card with the word END in the first 3 columns follows the first group of title cards. This procedure may continue with no limitations, however, the final group must be followed by a card with the word FINISH in the first 6 columns. This indicates the run is complete.

## SUMMARY OF CARD ORDER

1. $\substack{7\\9}$JOB,0025,0717/SMITH,10

2. $\substack{7\\9}$PRINTALL

3. $\substack{7\\9}$DEMAND,16000

4. Any EQUIP, TAPE, and REMARK Cards

5. $\substack{11\\0\\7\\9}$BANK, (1), /1/

6. $\substack{11\\0\\7\\9}$BANK, (0), ALL.

7. RBD of CLOUDPOP

8. RBD of ATSIN

9. RBD of .IOPACK.

10. RBD of PUT

11. RBD of BDECODE

12. RBD of CDECODE

13. $\substack{7\\9}$RUN,10,99999,1,,,99999,999

14. Main Parameter Card

15. Cloud Brightness Thresholds Card

16. Non-uniform Cloud Size Intervals Card(s)-if needed

17. Non-uniform Element Brightness Intervals Card(s)-if needed

18. Non-uniform Cloud Mean Brightness Intervals Card(s)-if needed

19. ATSIN Main Parameter Card (and Enhancement Cards if necessary)

20. Set of Title Cards (1 Title Card for each Grid of the Grid Matrix as specified by Parameters 4 and 5 of the ATSIN Main Parameter Card)

21. END Card if steps 14-20 are to be repeated

    FINISH Card if run is over

PROGRAM : ATSMPLT

LANGUAGE : F-63

COMPUTER : 3600

PROGRAMMER: Eric A. Smith - Tom Nash

DATE :

PURPOSE : This program prepares isometric plots of ATS grids. The grids are rotated 45 degrees counter clockwise and tilted toward the viewer to give maximum tri-dimensionality perception. The data are read,by ATSIN and may be transformed by the use of its various transformation parameters.

USAGE : This program is intended for future development.

PROGRAM : ATSSPEC

LANGUAGE : F-63

COMPUTER : 3600

PROGRAMMER: Eric A. Smith - Joe Wertz

DATE :

PURPOSE : This is an ATS power spectrum analysis program. The data are read by ATSIN and may be transformed by the use of its various transformation parameters. This program handles both east-west and north-south scans.

USAGE : This program is intended for future development.

PROGRAM : DISPLACE

LANGUAGE : F-63/Compass

COMPUTER : 3600

PROGRAMMER: Eric Smith

DATE :

PURPOSE : This program computes average cloud displacement over portions of ATS pictures. Data grids are first extracted from two ATS pictures and then "best fit" alignment is attempted (the user has a choice of two methods which are explained below). After alignment the cross product of the east-west and north-south displacement vectors is computed and converted to nautical miles. Since the time difference between pictures must be specified, the displacement motion is given in miles per hour.

USAGE : This program is presently under development.

SUBROUTINE : BDECODE

LANGUAGE : F-63/Compass

COMPUTER : 3600

PROGRAMMER : Jean Steitz

DATE : March 1, 1968

PURPOSE : This subroutine decodes ATS-B Line Documentation Data generated by the ATS-B MSSCC Ground Station equipment. The information is available in decoded form with the available option of printing it out.

USAGE : The following calling sequence is used:

```
CALL BDECODE(IIN,NN,IOUT)
```

IIN = Array which contains 3 48 bit words of packed ATS-B Line Documentation Data.

NN = 0 if no printing of documentation is desired.

= 1 if printing of documentation is desired.

IOUT= Array which contains the 20 words of unpacked documentation data.

## BIT PLACEMENT IN ATS-B LINE DOCUMENTATION

| | Documentation | Bits (In order first to last) | |
|---|---|---|---|
| | Intentional Blanks | 8 | |
| (1) | Tens Frame ID | 4 | |
| (2) | Units Frame ID | 4 | |
| | Intentional Blanks | 8 | |
| (3) | Scan Direction | 1 | |
| (4) | Ground Video Gain | 3 | |
| (5) | Satellite Video Gain | 1 | First Documentation Word |
| (6) | Phase-Lock-Loop Error | 3 | |
| | Intentional Blanks | 8 | |
| | Phase-Lock-Loop Error | 8 | |
| | Intentional Blanks | 8 | |
| (7) | Tens Days | 4 | |
| (8) | Units Days | 4 | |
| | Intentional Blanks | 8 | |
| (9) | Hundreds Days | 2 | |
| (10) | Tens Hours | 2 | |
| (11) | Units Hours | 4 | |
| | Intentional Blanks | 9 | |
| (12) | Tens Minutes | 3 | |
| (13) | Units Minutes | 4 | Second Documentation Word |
| | Intentional Blanks | 9 | |
| (14) | Tens Seconds | 3 | |
| (15) | Units Seconds | 4 | |
| | Intentional Blanks | 8 | |
| (16) | Scan Mode | 1 | |
| | Intentional Blanks | 1 | |
| (17) | Thousands Lines | 2 | |
| (18) | Hundreds Lines | 4 | |
| | Intentional Blanks | 8 | |
| (19) | Tens Lines | 4 | Third Documentation Word |
| (20) | Units Lines | 4 | |

NOTE: The numbers in parenthesis indicate the IOUT array indicis of the documentation.

## DOCUMENTATION PRINT OUT FORMAT

SCAN DIRECTION ____________________

SATELLITE VIDEO GAIN ____________________

SCAN MODE ____________________

FRAME IDENTIFIER ____________________

GROUND VIDEO GAIN ____________________

PHASE-LOCK-LOOP ERROR ____________________

DAY-OF-YEAR ____________________

HOURS ____________________

MINUTES ____________________

SECONDS ____________________

VERT. LINE COUNT ____________________

SUBROUTINE : CDECODE

LANGUAGE : F-63/Compass

COMPUTER : 3600

PROGRAMMER : Jean Steitz

DATE : February 16, 1968

PURPOSE : This subroutine decodes ATS-C Line Documentation Data generated by the ATS-C MSSCC Ground Station Equipment. The information is available in decoded form with the available option of printing it out.

USAGE : The following calling sequence is used:

```
CALL CDECODE (IIN,NN,IOUT)
```

IIN = Array which contains 2 48 bit words of packed ATS-C Line Documentation Data.

NN = 0 if no printing of documentation is desired.

= 1 if printing of documentation is desired.

IOUT = Array which contains the 26 words of unpacked documentation data.

## BIT PLACEMENT IN ATS-C LINE DOCUMENTATION

| | Documentation | Bits (In order first to last) | |
|---|---|---|---|
| (1) | Sync Error on | 1 | |
| (2) | Frame ID Tens | 3 | |
| (3) | Frame ID Units | 4 | |
| (4) | Scan Direction | 1 | |
| (5) | Channel A Video Gain | 3 | |
| (6) | P.L.L. Error Count | 12 | |
| (7) | Tens Days | 4 | First Documentation Word |
| (8) | Units Days | 4 | |
| (9) | Hundreds Days | 2 | |
| (10) | Tens Hours | 2 | |
| (11) | Units Hours | 4 | |
| (12) | Fiducial Mark Status | 1 | |
| (13) | Tens Minutes | 3 | |
| (14) | Units Minutes | 4 | |

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| | | | |
|---|---|---|---|
| (15) | Gray Scale On | 1 | |
| (16) | Tens Seconds | 3 | |
| (17) | Units Seconds | 4 | |
| (18) | Scan Mode | 1 | |
| (19) | Spacecraft Video Gain | 1 | |
| (20) | Thousands Vertical Line Count | 2 | Second Documentation Word |
| (21) | Hundreds Vertical Line Count | 4 | |
| (22) | Tens Vertical Line Count | 4 | |
| (23) | Units Vertical Line Count | 4 | |
| (24) | Record Color | 2 | |
| (25) | Channel C Video Gain | 3 | |
| (26) | Channel B Video Gain | 3 | |

NOTE: The numbers in parenthesis indicate the IOUT array indicis of the documentation.

## DOCUMENTATION PRINT OUT FORMAT

SYNC ERROR ON ____________________

FIDUCIAL MARK STATUS ____________________

GRAY SCALE ____________________

SCAN MODE ____________________

FRAME ID ____________________

SCAN DIRECTION ____________________

GREEN VIDEO GAIN ____________________

P.L.L. ERROR ____________________

DAYS ____________________

HOURS ____________________

MINUTES ____________________

SECONDS ____________________

S/C VIDEO GAIN ____________________

LINE COUNT ____________________

RECORD COLOR ____________________

BLUE VIDEO GAIN ____________________

RED VIDEO GAIN ____________________

PROGRAM : EPHB

LANGUAGE : F-63

COMPUTER : 3600

PROGRAMMER : Sue Peekna

DATE :

PURPOSE : This program decodes and outputs (print and plot) information from selected ATS-B Ephemeris Tape files.

USAGE : This program is presently under development.

PROGRAM : EPHC

LANGUAGE : F-63

COMPUTER : 3600

PROGRAMMER :

DATE :

PURPOSE : This program decodes and outputs (print and plot) information from selected ATS-C Ephemeris Tape files.

USAGE : This program is intended for future development.

PROGRAM : TELB

LANGUAGE : F-63/Compass

COMPUTER : 3600

PROGRAMMER : Dennis Phillips

DATE :

PURPOSE : This program decodes and outputs information from ATS-B Telemetry Tapes.

USAGE : This program is presently under development.

PROGRAM : TELC

LANGUAGE :

COMPUTER :

PROGRAMMER : John Benson

DATE :

PURPOSE : This program decodes and outputs information from ATS-C Telemetry Tapes.

USAGE : This program is presently under development.

ATS ______ RAW DATA ARCHIVE

Tape Identification

Day No. ______________________________

Date ______________________________

Time (Start) ______________________________

Tape Identification ______________________________

No. Of Lines ______________________________

Tape Reception

Date Received ______________________________

Date Logged ______________________________

Physical Condition of Tape ______________________________

Comments on Irregularities ______________________________

______________________________

Comments: ______________________________

______________________________

______________________________

______________________________

______________________________

______________________________

______________________________

______________________________

______________________________

Tape Use Log

Tape ID ____________________

No. Of Times Submitted ____________________

Comments On Tape: (Any problems with, or comments concerning this tape or its usage are to be recorded. Include in the comments, user name, and the date.)

# ATS ________ CROPPED DATA FILE ARCHIVE

Data Represented

Day No. ____________________

Time ____________________

Derivation

1. ATS Cropped Data Tape ID (External Label) ____________________

2. ATS Cropped Data Tape ID (Internal Label) ____________________

3. ATS Cropped Data Tape Density (Circle One)

   A. 200 B. 556 C. 800 D. 1600 BPI

4. ATS Raw Data Tape ID ____________________

5. User Generating Cropped File ____________________

6. Date Cropped File Generated ____________________

7. Program Generating Cropped File (Circle One)

   A. MENAGE B. TAPE EDIT C. Other ____________

8. Computer On Which Cropped Tape Generated (Circle One)

   A. 3600 B. B-5500 C. Other ____________

9. Total Number of Files on Cropped Tape ____________________

Information On File No. ________

| | No. On Cropped Data Tape | No. On Raw Data Tape | True No. |
|---|---|---|---|
| 1st Scan Line | 1 | | |
| Last Scan Line | | | |
| First Element | 1 | | |
| Last Element | | | |

Comments: ____________________

____________________

____________________

____________________

Tape Use Log

Tape ID ____________________

No. Of Times Submitted ____________________

Comments On Tape: (Any problems with, or comments concerning this tape or its usage are to be recorded. Include in the comments, user name, and the date.)

ATS - TAPE USE LOG

1. ATS - Tape ID ______________________________

Day No. ______________________________

Time ______________________________

2. ATS Tape Type (Circle Two)

A. ATS B B. ATS C

A. Raw B. Cropped C. Ephemeris D. Other __________

3. User ______________________________

4. Date ______________________________

5. Type Of Use (Circle One)

A. Generate Cropped Tape B. As Working Tape

C. Other ______________________________

6. Programs Used: ______________________________

______________________________

7. Machine Used:

A. B-5500 B. CDC-3600 C. CDC-1604 D. Other __________

8. No. Of Times Submitted ______________________________

9. Problems Encountered (Include date and time of run) ______________________________

______________________________

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______________________________

10. General Comments: ______________________________

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USER : ____________________________________________

USER REQUEST : ____________________________________________

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1) REQUEST DATE : ____________________

___ ___ ___

___ ___ ___

(delay period) ___ ___ ___

___ ___ ___

___ ___ ___

___ ___ ___

2) COMPLETION DATE : ____________________

___ ___ ___

(delay period) ___ ___ ___

___ ___ ___

3) DATE USER PRODUCES
ROUGH DISPLAY : ____________________

___ ___ ___

(delay period) ___ ___ ___

___ ___ ___

4) DATE USER PRODUCES
FINAL DISPLAY : ____________________

DELAY CODE

I - Insufficient Specification
By User

B - B5500 System Error

C - 3600 System Error

P - Program Error

T - Tape Error

O - Operator Error